Surveying and Mapping

July – September 1954

Quarterly Journal

AMERICAN CONGRESS ON SURVEYING AND MAPPING

Speeding Exploration and Engineering Development

First step in the production of AERO's dependable topographic maps is the aerial photography. Though the air mapping team's work comprises perhaps five per cent of the work behind the finished AERO map, it's the solid foundation on which the mapping structure depends.

Broadly experienced and highly skilled AERO flight crews guide the mapping plane along exact geometric patterns to assure complete air photo coverage. Then AERO's home office staff—photogrammetric engineers and technicians—translate the air photos into maps of engineering accuracy.

This expert team of flight and ground personnel is hastening completion of major engineering projects here and abroad. AERO crews also are greatly advancing exploration with the airborne magnetometer and scintillation counter in many areas of the world. Call on AERO's worldwide experience when you plan your next project.

AERO SERVICE CORPORATION

Philadelphia 20, Pennsylvania

AIRBORNE MAGNETOMETER SURVEYS
PRECISE AERIAL MOSAICS • TOPOGRAPHIC MAPS
PLANIMETRIC MAPS • RELIEF MODELS • SHORAN MAPPING

Affiliates in:
TULSA
SALT LAKE CITY
OTTAWA

Organization of the Congress

OFFICERS FOR 1954

President

CARROLL F. MERRIAM
Pennsylvania Water and Power Co.

Vice President

WILLIAM C. WATTLES
Glendale, Calif.

Executive Secretary

WALTER S. DIX
Maps and Surveys Division, TVA

Treasurer

RICHARD T. EVANS
U. S. Geological Survey (Ret.)

BOARD OF DIRECTORS

(Terms expire 1954, 1955)

FRANK S. BORDEN	1954
L. L. FUNK	1954
GEORGE H. HARDING	1954
G. W. HERZOG	1954
W. H. MILLER	1954
FRANKLIN G. WILLIAMS	1954
GORDON E. AINSWORTH	1955
B. EVERETT BEAVIN, SR.	1955
ROBERT H. RANDALL, JR.	1955
PAUL P. RICE	1955
REAR ADM. R. F. A. STUDDS	1955
ARTHUR J. SWEET	1955

PAST PRESIDENTS

ROBERT H. RANDALL
JOHN S. DODDS (Deceased)
GEORGE D. WHITMORE
FRANK S. BORDEN
MARSHALL S. WRIGHT
SOL A. BAUER
GERALD FITZGERALD
GEORGE H. HARDING
REAR ADM. R. F. A. STUDDS

CHAIRMEN, TECHNICAL DIVISIONS

ARTHUR F. STRIKER, *Cartography*
ALBERT J HOSKINSON, *Control Surveys*
HENRY B. AIKIN, *Education*
TALBERT ABRAMS, *Instruments*
WILLFRED B. WILLIAMS, *Property Surveys*
EARLE J. FENNELL, *Topography*

CHAIRMEN, STANDING COMMITTEES

CARROLL F. MERRIAM, *Executive*
JOHN M. AMSTADT, *Budget*
MARSHALL S. WRIGHT, SR., *Constitution*
WALTER G. STONEMAN, *Map Use*
FRANK S. BORDEN, *Membership*
SOL A. BAUER, *Professional Status*
MORRIS M. THOMPSON, *Publications*
B. EVERETT BEAVIN, SR., *Public Relations*
EXEC. SECRETARY
WALTER S. DIX, (Acting),
15th Annual Meeting

ADVISORY COUNCIL

C. C. LINDSAY
WILLIAM B. WILLIAMS
WILLIAM C. WATTLES
J. S. BEAZLEY

PUBLICATIONS COMMITTEE

MORRIS M. THOMPSON, *Chairman*
K. T. ADAMS (General)
FRANK S. BORDEN (General)
HAROLD R. BROOKS (Topography)
RAYMOND P. EYMAN (Education)
C. S. MALTBY (General)
FRANK C. MIRGAIN (Property Surveys)
HOWARD S. RAPPLEYE (Instruments)
WALTER W. RISTOW (Cartography)
MILTON O. SCHMIDT (Control Surveys)

Note.—Manuscripts of articles should be addressed to the Chairman of the Publications Committee, Room 2009, G. S. A. Bldg., Washington 25, D. C.

EDITORIAL STAFF

ROBERT C. ELLER, *Editor-in-Chief*
RICHARD E. NISWANDER, *Assistant Editor*
BERNARD SCHECHTER, *Assistant Editor*

American Congress on Surveying and Mapping

The American Congress on Surveying and Mapping is a non-profit association, organized to advance the sciences of surveying and mapping in their several branches, in furtherance of the public welfare and in the interests of both those who use maps and surveys and those who make them. It aims to establish a central source of reference and union for its members, to contribute to public education in the use of surveys and maps, and to encourage the prosecution of basic surveying and mapping programs, especially those programs which are paid for, in whole or in part, with public funds.

SURVEYING AND MAPPING is the official journal of the Congress and is published quarterly during the months of March, June, September, and December. The Congress welcomes articles and interesting news items for publication in its journal. Manuscripts should be sent to the Chairman of the Publications Committee.

For further information, write to

EXECUTIVE SECRETARY

AMERICAN CONGRESS ON SURVEYING AND MAPPING

BOX 470, BENJAMIN FRANKLIN STATION, WASHINGTON 4, D. C.

ADVERTISING IN SURVEYING AND MAPPING

To assist members to keep abreast of new developments in surveying and mapping instruments and equipment, and to afford suppliers of such items an advertising medium ideally suited for their market, the pages of SURVEYING AND MAPPING are open to commercial advertising. For rates and data, write to SCHALER, BUTLER, & ASSOCIATES, exclusive agents, at 1616 Eye Street, N.W., Washington 6, D. C.

INDEX TO ADVERTISERS

Abrams Instrument Corp.	272	Keuffel & Esser Co.	407
Aero Service Corp.	Cover 2	Lufkin Rule Co.	347
Wm. Ainsworth & Sons, Inc.	404	Monsen	274
American Paulin System	Cover 4	Ottico Meccanica Italiana	362
Bathey Manufacturing Co.	406	Park Aerial Surveys, Inc.	355
Bausch & Lomb Optical Co.	271	Porter, Urquhart & Beavir	296
Bausch & Lomb Optical Co.	401	R. L. Sargent Co.	402
C. L. Berger & Sons, Inc.	275	Schaler, Butler & Associates	400
Bludworth Marine	400	Surveyors Service Co.	408
Bowen & Co., Inc.	383	Transograph Co.	306
Craftsman Press, Inc.	296	Universal Instrument Co.	383
Geo-Optic Co., Inc.	318	Wallace & Tiernan, Inc.	273
Geo-Optic Co., Inc.	403	Warren-Knight Co.	296
W. & L. E. Gurley	268	Henry Wild Surveying Instruments	Cover 3
Kern Instruments Inc.	405	Zeiss-Aerotopograph	270

SURVEYING AND MAPPING is published quarterly by the AMERICAN CONGRESS ON SURVEYING AND MAPPING, Box 470, Benjamin Franklin Station, Washington 4, D. C. Yearly subscriptions to nonmembers: U. S. $5.00; foreign $6.00. Single copies $1.50 plus postage.

Entered as second-class matter at the Post Office at Washington, D. C., November 13, 1944, under the Act of March 3, 1879. Additional entry as second-class matter at the Post Office at Lancaster, Pa.

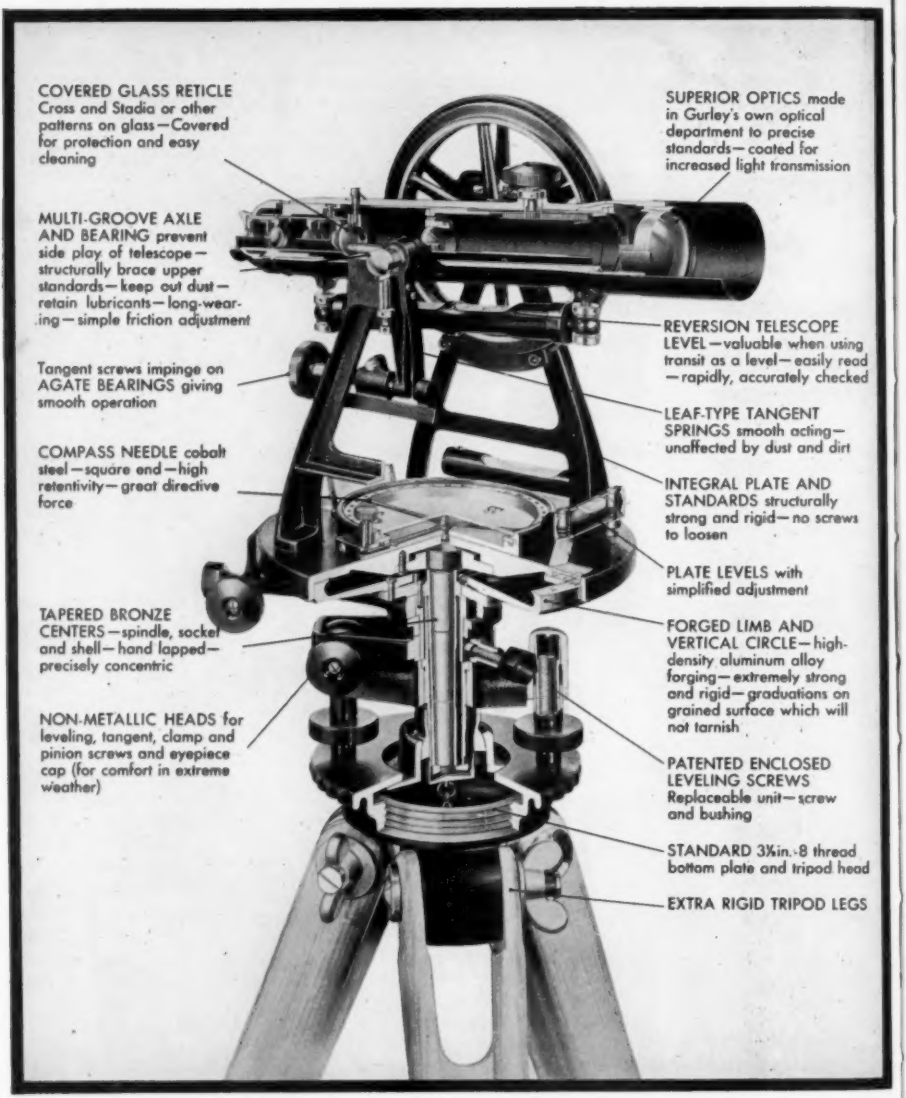
SURVEYING AND MAPPING

Robert C. Eller, *Editor-in-Chief*

A QUARTERLY JOURNAL
DEVOTED TO THE ADVANCEMENT OF THE SCIENCES
OF SURVEYING AND MAPPING

Volume XIV, No. 3
July–September 1954

PUBLISHED BY THE
AMERICAN CONGRESS ON SURVEYING AND MAPPING
BOX 470, BENJAMIN FRANKLIN STATION, WASHINGTON 4, D. C.


COVERED GLASS RETICLE Cross and Stadia or other patterns on glass—Covered for protection and easy cleaning
MULTI-GROOVE AXLE AND BEARING prevent side play of telescope—structurally brace upper standards—keep out dust—retain lubricants—long-wearing—simple friction adjustment
Tangent screws impinge on AGATE BEARINGS giving smooth operation
COMPASS NEEDLE cobalt steel—square end—high retentivity—great directive force
TAPERED BRONZE CENTERS—spindle, socket and shell—hand lapped—precisely concentric
NON-METALLIC HEADS for leveling, tangent, clamp and pinion screws and eyepiece cap (for comfort in extreme weather)
SUPERIOR OPTICS made in Gurley's own optical department to precise standards—coated for increased light transmission
REVERSION TELESCOPE LEVEL—valuable when using transit as a level—easily read—rapidly, accurately checked
LEAF-TYPE TANGENT SPRINGS smooth acting—unaffected by dust and dirt
INTEGRAL PLATE AND STANDARDS structurally strong and rigid—no screws to loosen
PLATE LEVELS with simplified adjustment
FORGED LIMB AND VERTICAL CIRCLE—high-density aluminum alloy forging—extremely strong and rigid—graduations on grained surface which will not tarnish
PATENTED ENCLOSED LEVELING SCREWS Replaceable unit—screw and bushing
STANDARD 3⅛in.-8 thread bottom plate and tripod head
EXTRA RIGID TRIPOD LEGS

The Gurley Precise Transit

W. & L. E. Gurley, Troy, N. Y.

GURLEY

July • Aug. • Sept. • 1954

Contents

Volume XIV
Number 3

INDEX TO ADVERTISERS 266
SPECIALIZED TRAINING IN SURVEYING AND MAPPING 276
Carroll F. Merriam
PLANNING FOR NATIONAL MAP COVERAGE 277
Earle J. Fennell
SURVEYING WITH THE VELOCITY OF LIGHT 283
Milton E. Compton, Jr.
MILITARY SURVEYING AND MAPPING INSTRUMENT RESEARCH 293
William C. Cude
A MOTORIZED PACKER 297
RECENT DEVELOPMENTS IN EUROPEAN INSTRUMENTS AND SURVEY TECHNIQUES 298
Capt. O. S. Reading
CARTOGRAPHERS AND THE CIVIL SERVICE 307
Ernest J. Stocking
NOTICE ON ORDERING REPRINTS 310
PROSPECTS FOR A B. S. DEGREE IN SURVEYING AND MAPPING 311
Marshall S. Wright, Sr.
AN IMPROVED CURRICULUM FOR CARTOGRAPHIC TRAINING AT THE COLLEGE AND UNIVERSITY LEVEL 319
George F. Jenks
SCRIBING TODAY 331
Charles F. Fuechsel
COMPULSORY TIES TO STATE PLANE COORDINATES? 339
Ralph Moore Berry
AUSTRALIAN COMMENTS ON THE TORRENS SYSTEM 348
MAPS AND MARKETING STUDIES 350
Christopher M. Weld
MONUMENT RESTORED ON GEORGE WASHINGTON SURVEY LANDMARK 356
PRESERVING THE OLD ORDER 357
Carroll F. Merriam
SURVEYING AND MAPPING NEWS 363
BOOKS IN REVIEW 372
MAP INFORMATION 375
COMMENT AND DISCUSSION 380
NEWS OF RELATED ORGANIZATIONS 384
FIFTEENTH ANNUAL MEETING 388
CONGRESS NEWS 389
NEW MEMBERS 396
APPLICATION FOR MEMBERSHIP 398
SUSTAINING MEMBERS 399
CONGRESS DIRECTORY 399
NOTICE TO ANNUAL MEETING EXHIBITORS 400

Opinions or assertions expressed in articles in this Journal do not necessarily represent the official views of the CONGRESS.

Characteristic Features

of the new Rectifier

SEG V

Wide-range enlargement 0.5 to 6.4 times - for all size negatives up to 9x9 inches

Automatic focusing - precision-type vanishing point control

Convenient rectification when using ground-controlled points or pre-determined data

Projection table freely accessible from 3 sides

Distortion-free, powerful Topogon V objective

Illumination by mercury vapor lamp or Aristo-Cold-Gridlite Type Vari

Low height - light weight

ZEISS AEROTOPO

ZEISS-AEROTOPOGRAPH

Mailing address: Ismaningerstr. 57, München (Munich) 27, West Germany

Sole Agents for U.S.A.
TRANSMARES CORPORATION

Head Office
15 William St.,
New York 5, N. Y.

Branch Office
Mr. M. S. Wright, Sr.
1308 Fort Hunt Road
Alexandria, Va.

ESC SERVIMUS

ENGINEERING SERVICE CORPORATION
LOS ANGELES, CALIF.

maps 70 hilly acres in one week...
at half the cost of ground methods...with

Bausch & Lomb
PHOTOGRAMMETRIC EQUIPMENT

Los Angeles realtors need fast action. Property must be mapped, laid out in lots, and approved by the Planning Commission, all within the realtor's 30-day option period. Engineering Service Corporation has found that in rough or rolling terrain "the fastest and *cheapest* way to get the data is by aerial methods." For instance, their B&L Multiplex Equipment enabled them to prepare accurate maps of this hilly 70-acre tract (scale: 1" 100 ft., with 5 ft. contours) within *one week!*

SECTION OF FINISHED MAP

WRITE for complete information on the world's finest photogrammetric equipment, including Multiplex, Auto-focus Rectifier, and Twinplex. Bausch & Lomb Optical Co., 37733 St. Paul Street, Rochester 2, N. Y.

ABRAMS
Photo Interpretation Team

Model CB-1 STEREOSCOPE

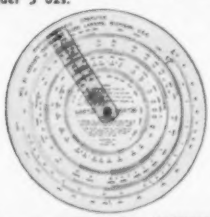
An excellent all purpose instrument that is particularly valuable for the study of small scale photography. It stands 5½ inches high in the two power position. Quickly adjustable for either 2 power or 4 power magnification. Durable case measures 7½ x 5 x 2⅜ inches, weight complete is only 13½ ozs.

Model HF-2 HEIGHT FINDER

Used with either the CB-1 or the CF-8 Stereoscopes to measure height by the Floating Dot method. Micrometer scale permits accurate parallax measurement. In its handy carrying case this instrument measures 8½ x 2¼ x ¾ inches and weighs under 5 ozs.

Model CF-8 STEREOSCOPE

The Abrams pocket-size "Explorer" stereoscope is extremely sturdy and lightweight — ideal for field use. Has two power magnification and 4¾ inch focal length. The CF-8 comes equipped with a leather carrying case and its total weight is 8 ozs.



Photogrammetric COMPUTER

An inexpensive, but important, member of the team. The Computer or "Photogrammetric Slide-rule" speeds the solving of parallax equations encountered in measuring heights from aerial photographs. Made of a heavy laminated plastic, it is 5¼" in diameter and weighs only ½ oz.

ABRAMS INSTRUMENT CORPORATION

LANSING 1, MICHIGAN, U. S. A.

Announcing...

THE NEW W&T ALTICORDER

(RECORDING ALTIMETER)

- Eliminates manpower at base stations.
- Permits immediate and continuous savings—recovery of initial investment within 100 days' use.
- Provides a permanent record of all pertinent base-station data on 35 mm. film.
- Eliminates observational errors.
- Operates continuously and without attention for periods up to eight days.

Elevations by W&T Altimeters NOW become more economical than ever.

Write today for complete information

WALLACE & TIERNAN
INCORPORATED
PRECISION INSTRUMENTS AND ELECTRICAL MECHANISMS
25 MAIN ST. BELLEVILLE 9, N. J.
In Canada: Wallace & Tiernan, Ltd., Toronto

A-107

This is the new and better way to letter map drawings faster!

Speed up map preparation. Avoid costly hand-lettering and pasting of small cartographic details. You get better maps this quick, easy way. We print names, numerals, symbols, etc., to your specifications on transparent acetate, backed with pressure-sensitive adhesive. Every impression is sharp and clean. Just place the name or symbol to its position and burnish it down. It sticks tight, but can be removed if necessary. Only the desired copy shows. Lines under the acetate reproduce clearly. *It's perfect camera copy!*

WRITE FOR THIS FREE self-explanatory type specimen book, test samples and prices.

Many styles of type, colors of inks, glossy or matte finish acetates.

MONSEN-CHICAGO, INC.
22 East Illinois Street, Chicago 11, Illinois

MONSEN-LOS ANGELES
928 South Figueroa Street, Los Angeles 15, California

MONSEN-WASHINGTON, D.C.
509 F Street, N.W., Washington 1, D.C.

•MONSEN-WASHINGTON, D.C.•509 F St., N.W.•NAtional 8-1900••MONSEN-LOS ANGELES•928 S. Figueroa St•Trinity 8754••MONSEN-CHICAGO•22 E. Illinois St•SUperior 7-1223••MONSEN-CHICAGO•22 E. Illinois St•SUperior 7-1223•

From project base line
to complete power plant installation...

Berger Instruments point the way for Stone & Webster engineers

"In laying out a power plant like this for The Hartford Electric Light Company, 1/32" is a critical dimension – whether you're establishing the initial project base line or aligning the turbine throttle valve – because all buildings and equipment must be accurately integrated into one operating unit," say the field engineers at Stone & Webster Engineering Corporation.

Berger Transits and Levels were used exclusively on this job – to meet these requirements:

All building base plates set for line and grade within a tolerance of 1/32".

Anchor bolts for coal handling equipment set to 1/16" to assure perfect fit in field erection of prefabricated sections.

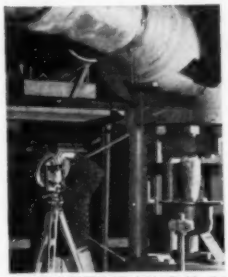
Alignment and elevation of main and auxiliary steam lines set under strain within 1/16" in order that they will assume their proper position after expansion takes place when lines become operative at a temperature of 950° F. Deviation from dead level held within ±1/32".

Center lines for all equipment — piping, generators, boiler feed pumps, pulverizers, condensers, etc. — must be accurately related to one set of base lines.

Rails for 120-ton overhead bridge crane 97'6" apart must be truly parallel within 1/16" and set accurately at required distance.

Berger Instruments were on the job here, as they are on so many other Stone & Webster projects. For when the "specs" call for really close-tolerance construction, leading engineers and construction men buy Berger . . . Take one into the field and see why. *Count on quick delivery—thanks to enlarged capacity.*

C. L. Berger & Sons, Inc., 37 Williams Street, Boston 19



CHECKING ALIGNMENT of the turbine throttle valve with Berger 6" Transit; grade set with Berger Level. Tolerances 1/32" in any direction.

ESTABLISHING GRADES for setting reclaim hopper with Berger Level.

CHECKING TURBINE GENERATOR to elevation within ±1/32" with a Berger Level.

THE BEST IN SIGHT IS

BERGER

ENGINEERING AND SURVEYING INSTRUMENTS... SINCE 1871

Write for a FREE copy of "ACCURACY IN ACTION"

Specialized Training in Surveying and Mapping

THE READERS' ATTENTION is called to several items in this issue of SURVEYING AND MAPPING dealing with the ever-increasing need for trained personnel to cope with the tremendous production of maps necessary to meet our requirements even in peacetime. What the demand would be in case of an outbreak of hostilities is difficult to estimate.

On page 387 there is a brief notice from the USAF Aeronautical Chart and Information Center announcing its need for cartographers and photogrammetrists. Very appropriately this issue also contains an enlightening article on "Cartographers and the Civil Service" by Ernest J. Stocking, U. S. Civil Service Commission, as presented at the Fourteenth Annual Meeting of ACSM last March. As evidence that efforts are being made to meet this demand with specially prepared personnel, there appears also an article by Prof. George F. Jenks, University of Kansas, on "An Improved Curriculum for Cartographic Training at the College and University Level." In a related vein, "Prospects for a B.S. Degree in Surveying and Mapping" is the subject of an article by Marshall S. Wright, Sr., with discussion by prominent educators in the field, as given at the Fourteenth Annual Meeting. An overall look at the national mapping program is presented in "Planning for National Map Coverage," by Earle J. Fennell.

It is obvious that the demand for cartographers cannot be filled as in the pioneer days by men transplanted from other branches of engineering and surveying. Much had to be done in the past through "in-service training" to adapt such men to the many and varied tasks of map production. The growth of the undertaking has obviously outmoded this method of recruitment and efforts must be made to supply the demand in a more methodical and economical manner.

This brings the hint of more or less complete separation between the training for engineers and the training for mapmakers, with the implication that cartography should become a separate profession from that of engineering. Whether this is a good thing or not remains to be seen, but in any case we should keep in mind that, even though it may appear that the cartographer should be given an entirely separate training from that of the engineer, the profession retains a common purpose with engineering in that the cartographer strives no less than the engineer to apply the forces of nature to the benefit of mankind.

Above all, let us not forget the objective of training our people for living as men among men. Let us give ear to the words of John Stuart Mill, given at an inaugural lecture at St. Andrews:

Men are men before they are lawyers or physicians or manufacturers; and if you make them capable men and sensible men, they will make themselves capable and sensible lawyers or physicians.

These well-considered words apply no less to surveyors and mappers than to lawyers and physicians. For we need to be capable men and sensible men before we can be capable and sensible surveyors or mappers.

—CARROLL F. MERRIAM

Planning for National Map Coverage

By EARLE J. FENNELL

U. S. GEOLOGICAL SURVEY

A DISCUSSION regarding the planning of a national topographic mapping program seems especially appropriate at this time, when our energies, hopes, and desires are in such large measure directed toward the peace, security, and prosperity of our country and of the countries throughout the world. Peace, security, and prosperity are related and are dependent in part upon economic development, which in turn depends upon the discovery and development of natural resources. Certainly topographic maps play a very important part in the search for, and development of, those resources. These maps also play a very definite part in the protection and preservation of our natural and human resources through their use in military defense activities.

Thus, it appears that topographic mapping can indeed be related closely to the solution of some of our major national and international problems. To those who are especially interested, an excellent summary of the uses of topographic maps in solving some of our national problems can be found in the supplemental report to House Document No. 706, which is entitled: "A Program to Strengthen the Scientific Foundation in Natural Resources." This report was prepared by Dr. J. R. Mahoney of the Legislative Reference Service of the Library of Congress. It deals with topographic and geologic mapping and water resources, and can be obtained from the Superintendent of Documents of the Government Printing Office.

There are several approaches to be considered in discussing a program for national map coverage. First, we should identify the types of maps that should be prepared under a National Topographic Mapping Program. Second, we should define its extent. Third, we should consider the present status of mapping. Fourth, we should consider recent proposals and cost estimates. Last of all, we should analyze our chances for getting the mapping done according to plan.

Presented at the Thirteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 23–25, 1953.

GENERAL-PURPOSE MAPS

It is felt that planning should be confined to the preparation of general-purpose maps, as distinguished from larger-scale special-purpose maps made as part of a particular project or development.

It is generally held that a national government is responsible for the preparation of a series of general-purpose maps covering the area of its influence. These maps are designed to serve a large number of map users having diverse needs. They are usually relatively small in scale, cover quite extensive areas, and are uniform in content.

There is one important element in a general-purpose map that may be lacking in a special-purpose map. That element is topographic expresion. Due to the necessity of reducing the majestic features of nature to the relatively puny scale of the general-purpose map, it is essential that certain professional interpretations of feature be maintained. This matter is especially critical in the geologic analysis of an area or in any study of physiography.

Topographic expression may not be as critical in a large-scale special-purpose map, because the more local and specific use of the map does not necessitate its comparison with many others. The importance of proper topographic expression in general-purpose maps was emphasized in last year's panel on map use. It is mentioned here as being applicable to our discussion.

EXTENT OF THE PROGRAM

The National Mapping Program covers the 48 States of the Union, Alaska, Hawaii, Puerto Rico, the Virgin Islands, Guam,

Status of topographic mapping in the United States and Territories as of March 1953.

and American Samoa. Some interest may also develop in extending the national map series to the trust territories in the Pacific.

PROGRESS TO DATE

In considering the present status of mapping, we might briefly review the work that has already been done toward a comprehensive mapping program. I do not think, however, we should go into too much detail. To begin with, at the time the four territorial surveys under the auspices of the Smithsonian Institution, Interior Department, and the War Department were abolished and the Geological Survey was created as the agency responsible for the classification of public lands and the examination of the geological structure, mineral resources, and products of the national domain, the need for topographic mapping was immediately apparent in order to provide base maps for these extensive investigations. Early planning for a comprehensive topographic mapping program dealt mainly with the basic elements of the problem. For one thing, it provided the format, or layout of map sheets, by dividing the United States into quadrangles.

The original plan anticipated the completion of a series of maps at 1:250,000 scale, although, as I recall from the historical references, the early completion of the series was not anticipated. That lack of anticipation was rather appropriate, because it is only recently that the completion of the 1:250,000 scale series appears to approach an actuality in the United States and Alaska, through the coordinated action of the Geological Survey and the Army Map Service.

This early plan, besides outlining a 1:250,000 scale series of one-degree sheets, also considered a 1:125,000 scale series of 30-minute sheets, and lastly, a 1:62,500 scale series of 15-minute sheets. It also anticipated that certain large-scale mapping would be necessary and actually, in the first year, 1879, some large-scale mapping, at 2,000 feet to the inch, was undertaken. To my knowledge, however, no concerted action was brought to bear on developing a finite mapping program until about 1920. By "finite," I mean a comprehensive program that was to be completed in a certain number of years.

At that time, however, a plan was developed which contemplated completing the mapping of the country in a period of 20 years. It was enacted into law in 1925, and was known as the Temple Act. References to that plan and much other valuable data of that era are available in the files of the Geological Survey and Congressional records. The plan is also outlined in the *Transactions of the American Society of Civil Engineers*, Volume 92, Page 1486, as Paper No. 1691, entitled: "Surveying and Mapping in the United States," by C. H. Birdseye, who was former Chief Topographic Engineer, U. S. Geological Survey. Also included in that paper are some interesting comments by T. P. Pendleton, who later became Chief Topographic Engineer. Other interesting comments were made by Maj. C. L. Hall, and Maj. John C. H. Lee, Corps of Engineers. The Temple Act was passed, but appropriations commensurate with the intent of the Act were not made and the mapping program did not move forward as contemplated under the plan. The mapping accomplished, during and prior to the Temple Act, and that which has been completed since the expiration of the Act or is in progress, is shown in the accompanying figure.

THE NEW PLAN

Recently another comprehensive plan for completing the topographic mapping of the country has been developed. Under this plan the mapping of unmapped areas and the remapping of inadequately mapped areas in the continental United States, Alaska, and Hawaii would be completed in a period of about 20 years, beginning as of 1951.

There is nothing magical about the 20-year period, as one might assume from its reappearance in this new plan. It is, instead, the shortest estimated span of years within which the mapping of the country can be completed efficiently and economically under normal conditions. Execution of the plan within this span of years depends upon many factors: availability of funds, range of requirements for 1:24,000 and

1:62,500 scale maps, developments in photogrammetry, variations in the efficiencies of personnel and plant facilities, the impetus of war; any or all of these factors may serve to prolong, or conceivably shorten, the estimated 20-year period. The salient elements of the proposal are:

1. To produce a mapping schedule that follows relative priority needs as determined by appraising the map requirements of Federal, State, municipal, and other agencies. Early priorities should be assigned to areas involving resources discovery and development, and land utilization and protection through irrigation and soil conservation. Appropriate priorities would also be allotted to areas classified as strategic to the Nation's military interest, and those at present or prospectively involved in the civilian functions of flood control, highway development, transmission of energy and fuels, industrial plant location, and city layout with such adjuncts as water supply and sewage disposal.

2. Urban areas, and areas involving intensive economic development or detailed natural resources investigations would be covered with maps suitable for publication at 1: 24,000 scale, that is, one inch equals 2,000 feet. The remainder of the United States would be covered with maps suitable for publication at 1: 62,500 scale, that is, one inch equals approximately one mile; possibly two-thirds of Alaska would be mapped for mile-to-the-inch publication, and the remaining one-third of Alaska at 1:250,000 scale, one inch equals approximately four miles.

3. Simultaneously with the mapping of new areas, maps previously completed will be revised periodically in order to bring them up to date. Corrections will necessarily have to be made to cover the many changes made by man in areas of rapid development. Newly completed and revised maps would be printed promptly and other maps would be reprinted as necessary to maintain adequate stocks for sale.

I should add that the plan also contemplates that the portion of the United States mapped for publication as a 7½-minute series at 1:24,000 scale would also be converted to the 1:62,500 scale, 15-minute series, so as to have complete coverage at the latter scale. Also, the maps would have to be revised periodically to maintain their full usefulness.

At this time it is not possible to foresee, or feasible to provide for, all of the general-purpose mapping that future generations will require. Also, technological developments, the intensity of land use, or the national defense may at some future time require detailed larger-scale mapping coverage far beyond that visualized in this program. However, the plan now contemplated appears to be in line with the requirements of the present and the forseeable future.

HOW MUCH WILL IT COST?

Perhaps it would be a good idea to say a word about the cost of this program. You will no doubt be interested in the cost, both as participants and as taxpayers. It is estimated that the total cost of completing the mapping according to this plan would be about $480,000,000. It is believed that a part of this program would be financed, as it has been in the past, by Federal-State cooperation. Also, perhaps the high priority of requirements of certain Federal agencies might lead to transfer of funds that would augment the appropriations made for the mapping program.

The cost of this program is dwarfed by the potential advantages to be gained in mineral research, water development, and in construction activities now contemplated. It has been estimated that, considering only three fields of map use—namely, highway, railway, and industrial—a mapping program of this scope would, within its 20-year life, result in the saving of at least five billion dollars in planning, construction, and operation. This saving amounts to 10 times the cost of the mapping. Among other savings in prospect are those relating to the large water developments throughout the West, and the investigations of the mineral wealth of the Nation.

GETTING THE JOB DONE

In broad terms, that is the plan. The question is what can we do to realize this plan and effect the maximum good in its realization?

I think we will have to stay close to the map users, so as to be sure we are doing the work where and when it is most urgently needed. We can do this by utilizing procedures developed recently with the Bureau of the Budget, which were furnished to the

map-using and map-producing Federal agencies as Budget Circular A-16. These procedures provide for determining map needs, on a priority basis, of the principal map-using Federal agencies and for the programming of these needs by the Federal map-making agencies. Consideration is also given to determining State and local needs.

Although this procedure takes good care of the Federal agencies, it does not take into full account the many private map users and the map needs of the various State agencies. It would seem to me to be a very good idea to strengthen the procedure by developing a system of State map advisory committees. The Geological Survey is doing some work in this regard, and it is an area in which a good deal more can be done. I think we should also be alert to new techniques in operation and to opportunities for bettering our product without necessarily increasing the cost.

The wide scope of this program calls for the close cooperation of all Federal and State agencies on mapping requirements, priorities, and coordination of operations, and the effective utilization of private industry in the aerial photographic and instrument manufacturing fields. The objective is a great and worthy one, and merits our best combined efforts.

Discussion

CHAIRMAN GRIFFITH: I will start off with the first question. Mr. Fennell, what is the extent to which the program has been successful in, say, the last year or the last year in which you have made complete records?

MR. FENNELL: I think I stated earlier that the program started in 1951. I believe that substantial progress has been made in 1951, 1952, and 1953. I can't cite the actual figures for the amount of money that has been spent. I stated that $480,000,000 was the estimate; but I believe that the plan contemplated the spending of about $18,000,000 in 1951; $21,000,000 in 1952; and $23,000,000 in 1953, by all Federal agencies engaged in domestic mapping.

Something like that amount of money has been made available. Perhaps the total is ten million dollars short of what should have been available, according to plan. But I would say that substantial progress has been made since 1951 on the national mapping program.

T. W. NORCROSS (Editor, *Photogrammetric Engineering*): During the past few years, it has been necessary to devote a considerable portion of the efforts to mapping for military purposes. Because of that mapping, the priorities that otherwise would have been established have obviously been disarranged. Is this military mapping entirely consistent and a part of the plans for the national mapping?

MR. FENNELL: Mr. Norcross, it is. The mapping for military purposes is a part of the plan for completing the mapping of the United States.

At present the mapping done by any of the Federal map-making agencies, principally the Geological Survey, is taken by the military and published at 1: 25,000 or 1: 50,000 scale. Civilian publication of the same materials is made at 1: 24,000 or 1: 62,500 scale. So there is no lost motion there. All the mapping is applicable to the comprehensive program.

CHAIRMAN GRIFFITH: Are there any other questions? Is anybody interested in cost per square mile? A touchy subject? Do you want to say anything about that, Mr. Fennell?

MR. FENNELL: Well, I am really not an authority on cost per square mile. Is there anybody in the audience who is?

CHAIRMAN GRIFFITH: Four hundred and eighty million dollars didn't sound so good.

MR. FENNELL: I think we can say the cost per square mile varies. It depends so much on the terrain, work conditions, and contour intervals. I think perhaps it varies from $85 per square mile to perhaps $300 per square mile for 1: 62,500 and 1: 25,000 scale mapping, respectively. That is taking the entire range. I would invite anybody in the audience to make a comment regarding costs, if they have any better information at hand.

CHAIRMAN GRIFFITH: I have an ulterior motive in asking that question. I have seen some accounting lately that falls within the range that Mr. Fennell suggested.

MR. PERKINS (Connecticut): We have recently let out some photogrammetric surveys to contractors. We find the ability of the contractor to bid is very seriously limited by the work the Army is requiring of them. Isn't there any

program for the setting up of any of the services to do that work or is this going to be a continual drain on the photogrammetric men for years?

MR. FENNELL: That is a good question, Mr. Perkins. Some use is presently being made of commercial photogrammetric facilities. I think perhaps the drain you spoke about can best be explained by a representative of the Army Map Service; if there is one in the audience, I would invite him to answer that question.

CHAIRMAN GRIFFITH: Is there any one from the Army Map Service who cares to comment on that? (There was no response).

MR. FRENCH (U. S. Coast and Geodetic Survey): Who is charged with the mapping of the Missouri River Basin? Are the Army Engineers in there or the Geological Survey?

MR. FENNELL: That work is presently being done by and is the responsibility of the Geological Survey as a part of the mapping of the entire United States. Much of the work there is done primarily for the Corps of Engineers and the Bureau of Reclamation. The maps are standard quadrangle productions and are a part of the national mapping program.

MR. KOWALCZYK (U. S. Navy Hydrographic Office): You referred to the last three years, 1951, 1952, and 1953; does that embrace only the planning stage or does it also include the production stage, such as control, photography, reproduction, and so on? The program reads "planning." The title on your paper is "planning."

MR. FENNELL: The money figures I cited represent the production of maps, very definitely.

Centesimal Trigonometric Functions

THE METRIC (centesimal) system of angular measurement, wherein the circle is divided into 400 grads with each grad subdivided decimally, has been in extensive use in Europe, particularly in Germany, where it has been the legal system, even in land surveys, since 1937.

At the end of the war, many fine surveying instruments found their way to the United States, where their quality was much appreciated but their usefulness considerably impaired by the lack of suitable tables of trigonometric functions for the centesimal angles. The purpose of this note is to direct attention of interested surveyors to the following tables:

(*a*) Army Map Service Technical Manual No. 1. Five Place Natural Sine and Tangent Functions in the Centesimal System. A handy five-place table of the four major trigonometric functions to every centesimal minute (0.01 grad), with conversion tables for centesimal to sexagesimal angles and for sexagesimal to centesimal angles. Available upon request to the Commanding Officer, Army Map Service, 6500 Brooks Lane, Washington 25, D. C. Price, 50 cents.

(*b*) PETERS, J., Siebenstellige Werte der Trigonometrischen Funktionen von Tausendstel zu Tausendstel des Neugrades, published by the Institut für angewandte Geodäsie, Frankfurt, 1952. An excellent seven-place table of the natural values of the four major functions, listed to every ten centesimal seconds (0.001 grad). Available in the United States from Sidney Kramer Books, 1722 H St., NW., Washington, D. C. Price, $18.50.

(*c*) International Union of Geodesy and Geophysics, Tables à 8 Decimales des Valeurs Naturelles des Sinus, Cosinus, et Tangentes dans le Système Decimale. An eight-place table of natural sines, cosines, and tangents, listed to every centesimal minute (0.01 grad), with special tables and charts for interpolation to eight-place accuracy. The table provides the means for obtaining any function to eight decimal places but is recommended only if eight-place accuracy is required, as interpolation is required for entry closer than 0.01 grad, which makes its use rather laborious. Available in the United States on order placed with Frank L. Culley, Associate Secretary, International Association of Geodesy, care of United States Coast and Geodetic Survey, Washington 25, D. C. Price, $3.25.

Also of interest is the fact that the "Aristo" line of protractors and slide rules, made in Germany, includes a centesimal protractor and an excellent 10-inch plastic surveyor's slide rule (No. 958) having scales of sines, tangents, and versines (for slope correction to inclined measurements), available in either centesimal or sexagesminal graduations in addition to the standard scales for multiplication, division, and square root. These items are available through the Geo-Optic Company, New York.

—RALPH MOORE BERRY

Surveying with the Velocity of Light

By MILTON E. COMPTON, JR.

ENGINEER RESEARCH AND DEVELOPMENT LABORATORIES, FORT BELVOIR, VIRGINIA

THERE IS a representation on the wall of the Egyptian tomb of Menna at Thebes, XVIII dynasty, of two chainmen surveying in a field of corn. There has, of course, been improvement of surveying technique since this early recorded attempt of man to measure distances on the surface of the earth, but the method remains. Surveyors today are still measuring distances utilizing the age-old methods of chains or tapes. Chaining requires great physical effort and, of major importance, much time. Present methods require extensive reconnaissance, selection of limited level areas, clearing of trees and brush, staking, leveling of the line, and finally careful measurement with tapes several times to insure the precision required for the use of modern military weapons. Time is of the essence and must be bought in blood if required artillery or missile fire cannot be directed on the desired point due to inadequate mapping control.

A NEW DEVICE

A device of revolutionary nature in the field of geodetic control is currently being evaluated by the Engineer Research and Development Laboratories. The Surveying Branch of the Laboratories has for many years followed the development of all types of distance measuring equipment. The work of Dr. Erik Bergstrand, a Swedish geodesist, has been of particular interest. In 1941, Dr. Bergstrand investigated the method of Fizeau for measuring the velocity of light, applying modern electronic techniques. In 1948, Dr. Bergstrand produced his first distance measuring equipment and, after making many measurements, permitted the AGA Gasaccumulator Co., Stockholm, Sweden, to redesign the equipment for commercial production. The Laboratories procured models of the AGA instrument which were delivered early in 1953. The instruments have been undergoing tests since that time.

THE GEODIMETER

Dr. Bergstrand has named his device the geodimeter, from "geo," meaning earth, and "meter," to measure. The device is designed primarily for the determination of geodetic distances, such as precise base lines used in triangulation, and may be used under special conditions for surveying by trilateration methods. The geodimeter is an electronic-optical instrument which will give precise distance measurements using the fundamental constant, the velocity of light. The distance is obtained by determining, indirectly, the time interval for the wave front of a light beam to travel from the geodimeter to a distant mirror and return to the geodimeter. Knowing the velocity of light, the distance may be readily computed. It is believed that the presently utilized value for the velocity of light in vacuum, 299,793.1 kilometers per second, is accurate to between 1 part in 500,000 and 1 part in 1,500,000. Of course, it is necessary to propagate in the atmosphere, and, as it is impossible to have accurate knowledge of the transmission path throughout its length, meteorological data is the greatest source of error. Temperature, pressure, and humidity field data are required and are normally observed at each end of the line being measured. Under reasonably good visibility conditions, distances of 20 to 25 miles can be measured. Under excellent visibility conditions the range may be 40 to 50 miles.

BASIC PRINCIPLES

The basic principle of the measuring system is most readily explained by a comparison with the Fizeau method for determining the velocity of light. It may be recalled

Presented at the Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954.

from the college physics texts that Fizeau in 1849 made the first laboratory determination of the velocity of light by utilizing a light source, a toothed wheel, a mirror reflector, and his eye as the detector (fig. 1). Light intensity was modulated by rotating the toothed wheel. Thus pulses of light were transmitted to the distant mirror where they were reflected and observed by Fizeau through the spinning teeth of the rotating wheel. By knowing tooth and space dimensions, wheel-rotation speed, and distance from wheel to mirror, the velocity of light could be computed by observing the wheel-rotation speed when the reflex appeared bright or dark. The geodimeter employs a Kerr cell as the modulating agent in place of the toothed wheel. A Kerr cell consists of a glass container made to optical specifications in which there are two electrodes immersed in a birefringent[1] substance, such as very pure nitrobenzene. It may be considered for the purpose of analysis as an instantaneous shutter.

Figure 2 shows a representation of the geodimeter optical modulating system. The light source is a 20-watt tungsten projection lamp. Light from this source passes through a condenser lens, a polarizer, the Kerr cell, and then a second polarizer. Light normally emitted from a lamp is randomly polarized. When light encounters the first polarizer, all light is rejected with the exception of that polarized at angle θ. This plane-polarized light now passes through the Kerr cell and encounters the second polarizer whose polarization is at right angles to that of the first polarizer, thus light cannot be transmitted. However, when voltage is applied across the electrodes of a Kerr cell the nitrobenzene within the cell becomes doubly refracting. This, in effect, rotates the plane-polarized wave from the first polarizer and permits light to pass through the second polarizer in accordance with the applied voltage on the Kerr cell.

From the considerations of the modulating agent, it may be seen that we have in effect pulses of light being transmitted when the Kerr cell is pulsed by an applied voltage.

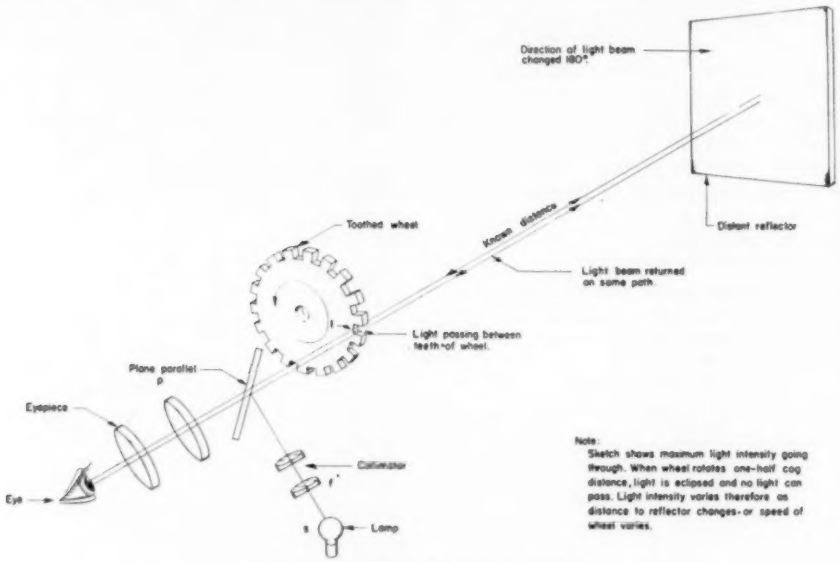

Direction of light beam changed 180°.
Toothed wheel
Kerr cell distance
Distant reflector
Light beam returned on same path.
Light passing between teeth of wheel.
Plane parallel
Eyepiece
Eye
Collimator
Lamp
Note:
Sketch shows maximum light intensity going through. When wheel rotates one-half cog distance, light is eclipsed and no light can pass. Light intensity varies therefore as distance to reflector changes or speed of wheel varies.

FIGURE 1.—Fizeau's toothed wheel.

[1] Birefringent = doubly refracting.

In the geodimeter, the Kerr cell and crossed polarizers replace the toothed wheel of Fizeau. The Kerr cell is modulated at a frequency of 10 megacycles per second. The modulated light travels from the geodimeter to a distant reflex system which returns it to the geodimeter receiver. The receiver portion consists of a photomultiplier tube in which the light signal is amplified and applied to a special null-detector amplifier circuit. Thus, in the geodimeter, the photomultiplier replaces the human eye of the Fizeau method.

Figure 3 shows a generalized schematic diagram of the geodimeter system. In a conventional radar system, a pulse of electromagnetic energy is transmitted to a target, and reflected back to the transmitting station; a measure of the time lapse between transmission and reception is made to determine the distance. Similarly, a measure of elapsed time is required in the geodi-

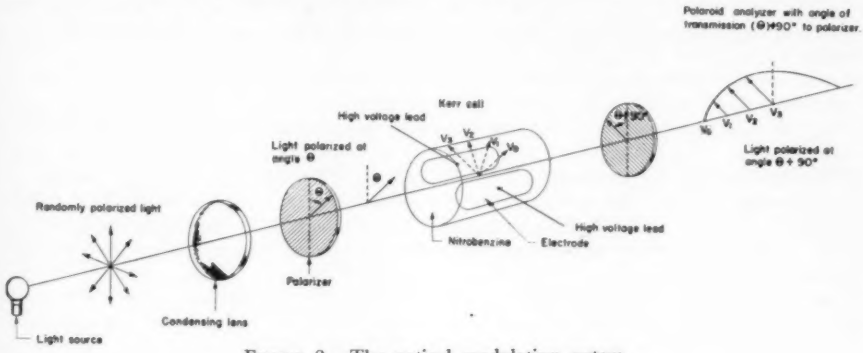


FIGURE 2.—The optical modulating system.

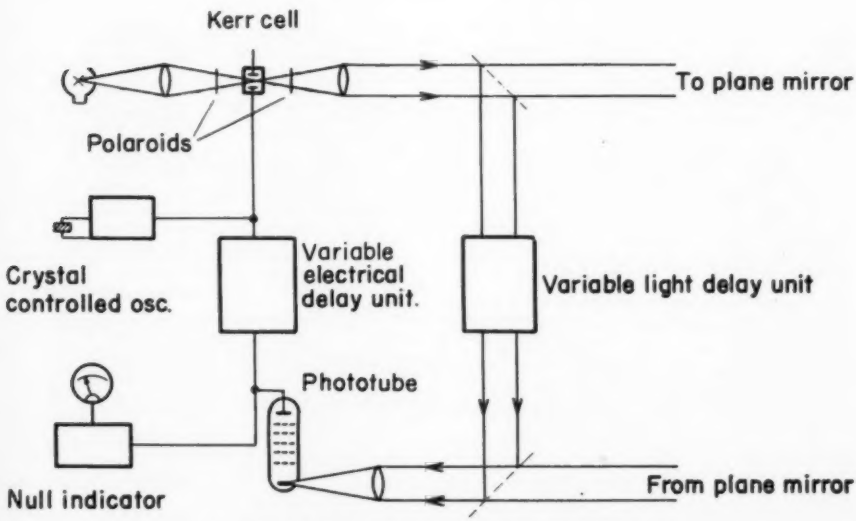


FIGURE 3.—Schematic diagram of the geodimeter.

meter; this is accomplished by a phase-comparison technique. The high-frequency signal that modulates the light wave also passes through an electric delay line. The electrical delay may be continuously adjusted to provide, electrically, the same time delay that the high-frequency modulated light encounters in its trip from the geodimeter to the reflex system and return to the geodimeter. When the electrical delay is properly adjusted in a measurement, the special null-detector circuit indicates zero on a meter. Electrical delay circuits, as the present state of the art exists, cannot be made stable for appreciable periods of time. For this reason it is necessary to calibrate the delay line after each measurement on the reflex system. This calibration is accomplished uniquely by providing a "built-in," continuously variable light path in the instrument (*See* fig. 4.) Thus, when the equivalent value of electrical delay has been determined the "known" stable light path is matched to this value to determine the distance. Since the modulation is continuous, it is not required that the built-in delay be as long as the maximum-length line to be measured, but need only be slightly longer than a quarter wave-length of the modulating frequency.

Another way of considering the geodimeter system is shown in figure 5. If we may assume that the geodimeter and the mirror are separated by an integral number of quarter wavelengths of the modulating frequency, the null detector will indicate zero. If the geodimeter be moved toward the mirror the meter will indicate zero at every integral quarter wavelength. We may see from this that we have, in effect, fixed in space by the modulating frequency a measuring stick with units 7½ meters apart. In practice the geodimeter, of course, is not on a null. Since it would be difficult to move the geodimeter or the mirror to the nearest null and measure the movement required, the electrical delay circuit has been provided to electrically "move" the geodimeter to the first null point. One may observe from figure 5 that

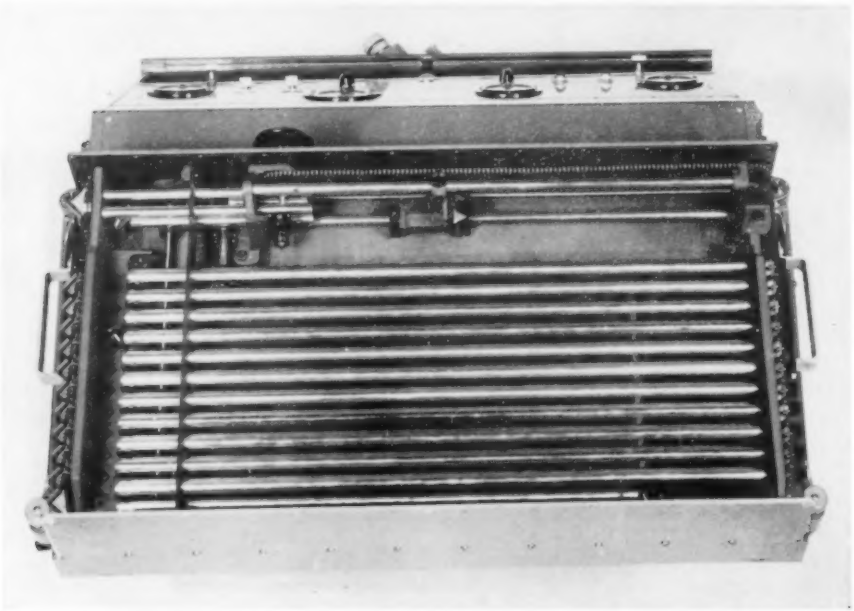


FIGURE 4.—The "light conductor" (calibrated light path), cover removed.

if the distance from the reference point on the geodimeter to the first null point is known (determined from the observation), and the number of null points between the first null and the mirror are known (requires distance to be known to ± one-quarter wavelength), and the length of a quarter wave of the modulating frequency is known (frequency must be known), then the distance from the reference point to the mirror may be readily determined. If only one frequency is used, say 10 megacycles, then the distance from the geodimeter to the reflex system must be known to ± 7½ meters. Such a knowledge of the distance would restrict the use of the instrument to precise determination of roughly measured lines. However, a second frequency is provided which is 1 percent higher than the first, or 10.1 megacycles. The second frequency has a wavelength 1 percent less than the first. By making measurements on two frequencies a vernier effect is obtained in space and with the two frequencies the distance need be known only to ± 750 meters or approximately ± one-half mile. Knowledge of the distance to be measured to the nearest mile is not considered a restriction on the use of the equipment since from the roughest maps distances may be scaled to this accuracy. If no maps are available of the line to be measured, a rough triangle could be established for the approximate distance determination.

ACCURACY

The geodimeter measurement system is inherently precise. Theoretically, the ultimate accuracy would be affected only by the frequency, which is accurate to 1 or 2 parts in 10 million, but, as measurements are made in the atmosphere, the effects of light-velocity changes and refraction must be considered. An error from the mean for the measurement path of one degree of temperature Centigrade, 3 millimeters of pressure, 40 millimeters of mercury of aqueous vapor pressure, and an effective wavelength error of 200 Angstrom units (caused by atmospheric dispersion), each affect a measurement by one part in one million. Thus it is necessary to measure these factors carefully to determine the precise distance. Measurements conducted thus far by the Surveying Branch, ERDL, have a probable error ranging from 1/500,000 to 1/4,000,000.

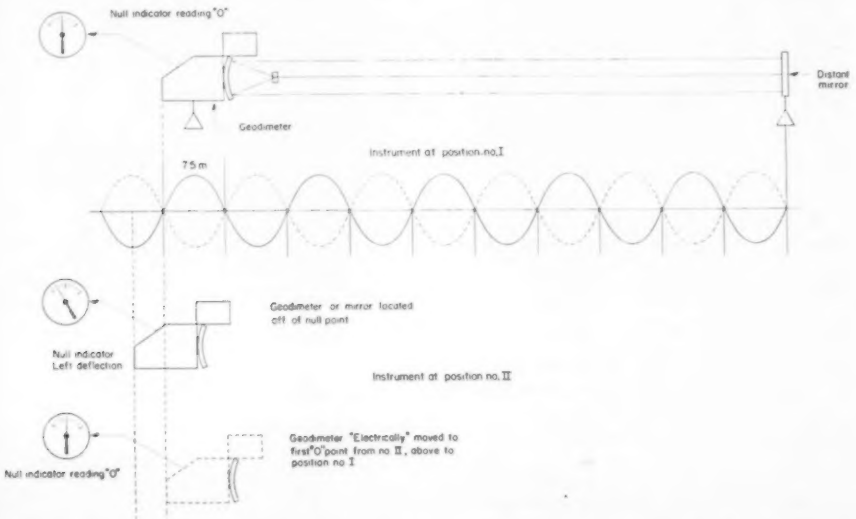

Null indicator reading "0"
Distant mirror
Geodimeter
Instrument at position no. I
75 m
Geodimeter or mirror located off of null point
Null indicator Left deflection
Instrument at position no. II
Geodimeter "Electrically" moved to first "0" point from no. II, above to position no. I
Null indicator reading "0"

FIGURE 5.—Null-indicator reading effects with geodimeter (or mirror) on and off null points.

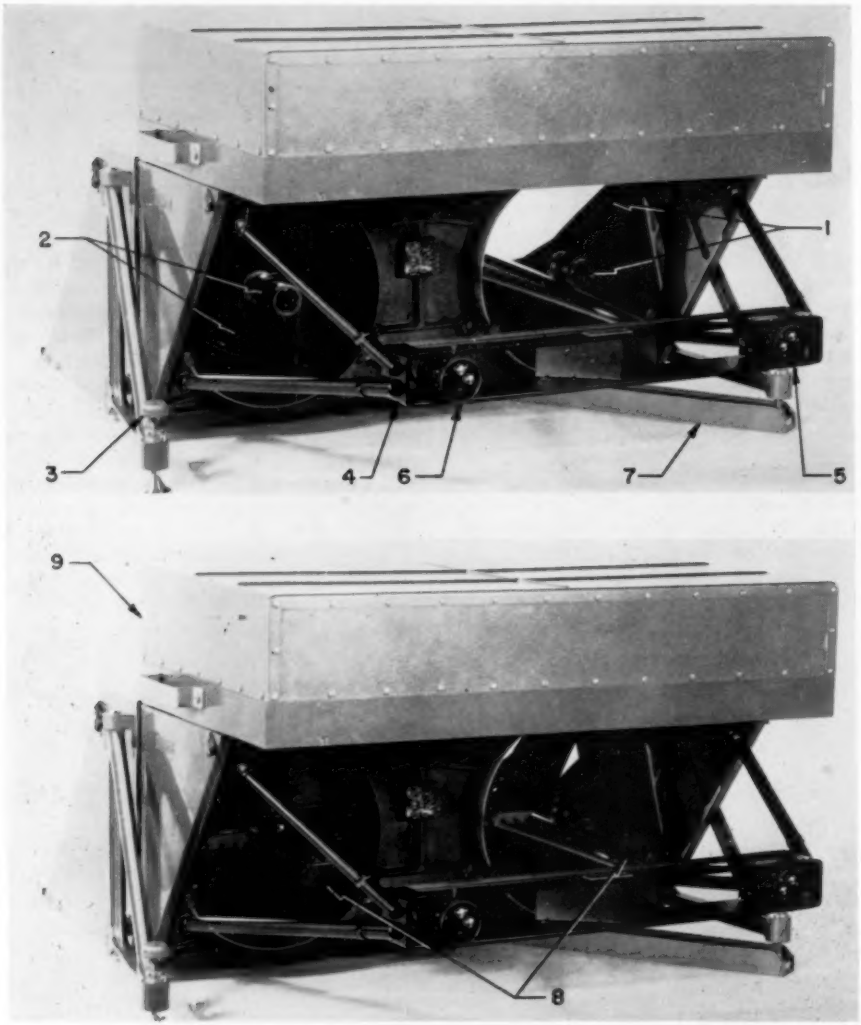


FIGURE 6.—Views showing the projection side of the geodimeter, (top) for observing on mirror and (bottom) for observing on light conductor.

1. Transmitter spherical mirror and collimating lens.
2. Receiver spherical mirror and collimating lens.
3. Fixed support about which geodimeter swings.
4. Adjusting beam supporting small spherical mirrors.
5. Transmitter focusing adjustments.
6. Receiver focusing adjustments.
7. Adjusting beam and instrument support.
8. Mirror deflection arms.
9. Housing for light conductors.

EQUIPMENT DETAILS

The geodimeter proper consists of two basic units—the measuring unit which contains the necessary electronics, and the light-conductor unit which contains a continuously variable known light path whose length has been precisely determined by calibration measurements in the laboratory. (*See* fig. 4.) Also mounted on the light-conductor unit are two spherical mirrors, approximately 12 inches in diameter. (*See* fig. 6.) When the geodimeter is assembled for a measurement, auxiliary small mirrors are attached to the light-conductor unit in front of the spherical mirrors to form a Cassegrainian system.[2] The secondary mir-

[2] Cassegrainian system: See any standard textbook on optics.

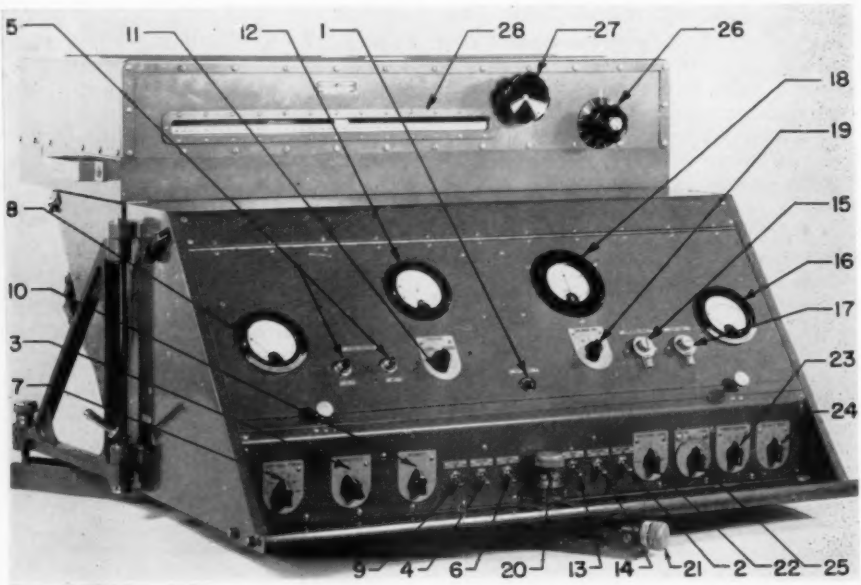


FIGURE 7.—View showing the geodimeter assembled. The forward section is the measuring unit and the rear section is the light conductor. The part listing below is, in general, the order of operation.

1. Hand lamp receptacle.
2. Hand lamp switch.
3. Frequency selector switch.
4. Heater switch.
5. Crystal oven lights.
6. Plate switch.
7. Kerr cell tuner.
8. Kerr cell tuning indicator.
9. Lamp switch.
10. Lamp intensity control.
11. Selector switch for heater and lamp voltage.
12. Voltmeter (for heater and lamp).
13. Bias switch.
14. Photocell switch.
15. Control for bias on photo tube amplifier.
16. Meter indicating relative amount of light entering photo multiplier.
17. Control for zeroing null indicator.
18. Null-indicator meter.
19. Sensitivity control for null indicator.
20. Screw for vertical positioning of unit.
21. Screw for horizontal positioning of unit.
22. Control for variable grey wedge.
23. Phase position indicator.
24. Electrical delay coarse indicator.
25. Control for fine adjustment of electrical delay.
26. Light conductor coarse control.
27. Light conductor fine control.
28. Scale of continuously variable part of light conductor.

rors are readily removable for transportation. The electronic measuring unit weighs approximately 108 pounds and the light conductor weighs about 115 pounds. (*See* fig. 7.) Both units are provided with rugged transporting cases with rubber shock mounts for support of the units. Each unit in its transporting case may be carried by two men. The power requirement for the instrument is 140 watts. This is furnished by a 150-watt portable generator weighing about 24 pounds. The reflex system, as furnished with the geodimeter, consisted of a plane mirror with horizontal and vertical slow motion screws and a Gaussian telescope mounted normal to the mirror surface. (*See* fig. 8.) This reflex system, although useable, proved to be very difficult to aline and keep in alinement when measuring longer lines because of refraction changes. The Surveying Branch therefore fabricated a special mount containing 54 small triple prisms. (*See* fig. 9.) The triple-prism system is furnished with a stub so that it will fit the universal tribrach. It was, of course, necessary to determine the prism constant for such a system and to consider dispersion and path length in the glass. The triple-mirror or prism system has proven very satisfactory. The new system weighs 20 pounds or one-half the weight of the plane mirror. The triple-prism system is not critical as to alinement and can be as much as 30 degrees off in pointing without affecting the measurement. Also, vibration such as might be encountered in tower work has a negligible effect on the measurement. Testing of the plane-mirror reflex system has been discontinued because of the success of the triple-prism system.

Radio communication between geodimeter and reflex site is maintained by the AN/PRC-6 or "Handie-Talkie" type FM radio. As measurements are always made "line-of-sight," a simple whip or ground-plane type of antenna is quite satisfactory for these small radios.

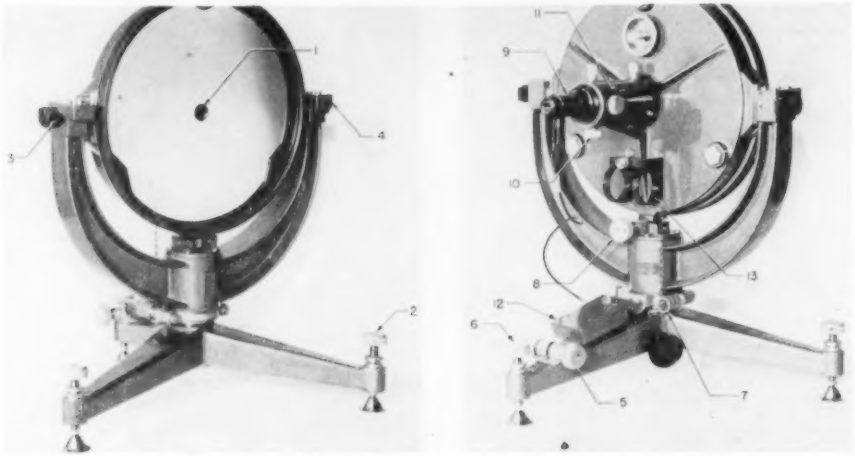


FIGURE 8.—Front and rear views of plane mirror as set up for use.

1. Plane mirror with unsilvered sighting hole.
2. Leveling screw.
3. Plumb line support.
4. Plumb line support.
5. Horizontal tangent screw.
6. Vertical tangent screw.
7. Horizontal clamp screw.
8. Vertical clamp screw.
9. Sighting telescope with Gaussian eyepiece.
10. Vertical collimating screw for telescope.
11. Horizontal collimating screw for telescope.
12. Battery case.
13. Bracket to support telescope in packaging.

METEOROLOGICAL AND TERRAIN CONSIDERATIONS

Meteorological equipment consists of precision Centigrade thermometers and military-type surveying altimeters with sling psychrometers. Meteorological measurements are made concurrently with measurements at the geodimeter and reflex site and the means of the observed conditions are used for determining corrections to the distance. Since it is impossible to completely integrate the transmission path, meteorological conditions will be most nearly constant when the light path is well above ground. This condition also permits longer ranges since high spots in an area are usually picked for station sites. This is in direct contrast to the conventional base lines which are nearly always established in a level section of terrain such as along a railroad right-of-way. The geodimeter, of course, can measure under such conditions but the full advantages of the instrument are not then realized. Since conventional base lines have in the past been established in level areas, the lengths of such bases have been necessarily short, and in most areas high towers are erected on each end of the base to extend the triangulation scheme Now it would seem that for the first time since man's earliest surveying effort, the more desirable high points in the area to be mapped may be selected. In general, this should result in longer base lines and consequently stronger triangles and an overall higher order of geodetic control.

MEASUREMENT TIME

Normally the minimum time required for a geodimeter measurement including setting up and adjustment of the instrument is about two or three hours. In this time, under good visibility conditions the base can be measured more than once and under fair conditions can be measured at least once. Present test measurements are being repeated several times during the night and on various nights to detect any unusual instrumental characteristics or meteorological variances. A typical field set-up of the geodimeter is shown in figure 10.

Computation of a point-to-point measurement by the geodimeter has been arranged in such a manner that meteorological measurements are applied as distance corrections and the entire computation is made up of simple additions or subtractions which can be made in 30 minutes.

PERSPECTIVE

Measurements have been made on one-, two-, and six-mile base lines. Further measurements are planned on other bases up to 20 miles in length. Trilateration methods are also thought feasible and will be investigated in the future. The maximum range of the instrument will be determined. This is estimated to be 50

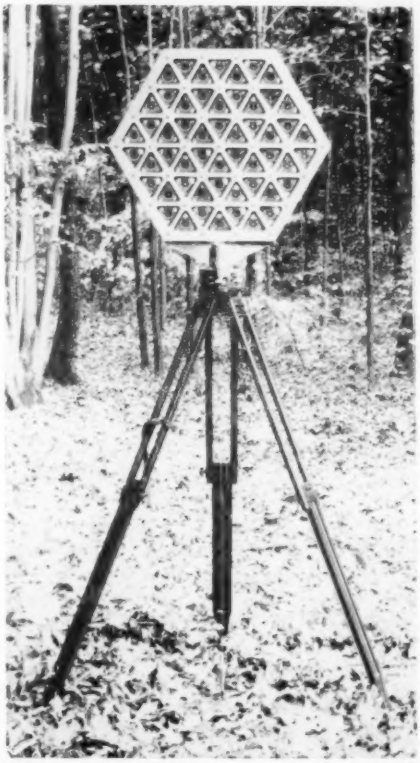


FIGURE 9.—The 54-bank retrodirective (triple-prism) system.

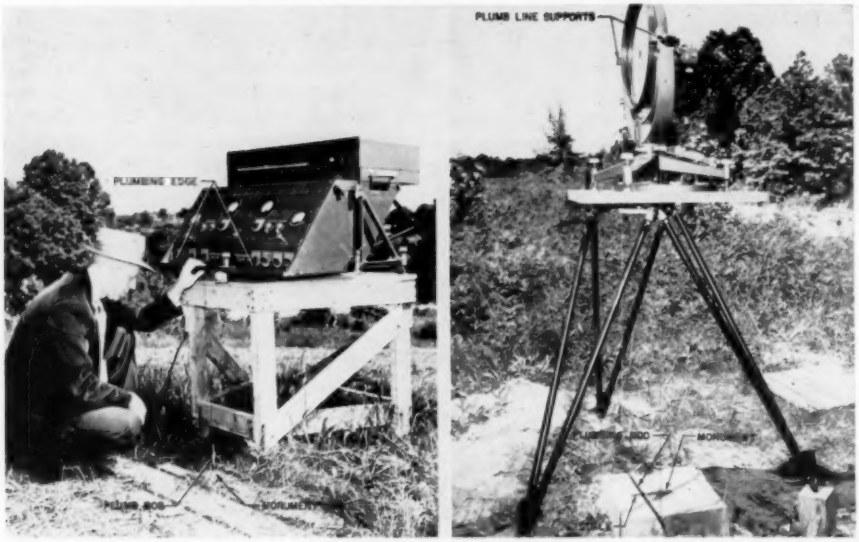


FIGURE 10.—Views of geodimeter (left) and plane mirror (right) set up over the base line monuments, showing methods of plumbing over the marks and determining eccentricity. As shown in plane mirror set-up, a millimeter scale is used to measure eccentricity normal to plumbing rod, and parallel plumbing rod to line of sight. Distance measured by the geodimeter is that between the edge of the geodimeter and the front surface of the plane mirror.

miles under ideal visibility conditions. Arcs of triangulation 20 miles in length have been measured. It is difficult as yet to make a qualitative comparison with existing bases since the accuracy of the instrument is of the same order as the base lines and until many lines have been measured the accuracy can only be estimated. It would seem, however, that the instrument as it presently exists is a capable device that can measure with an accuracy comparable to any known method and with an enormous saving of time and manpower. The geodimeter is not very old and it might not be beyond the realm of prediction that in the not too distant future, improvement as to weight and size will place in the hands of the surveyor, military and civilian, a device of great accuracy, versatility, speed, and portability.

Engineer Research Labs Announce New Head

Col. H. F. Sykes, Jr., assumed command recently of the main research center of the Corps of Engineers—the Engineer Research and Development Laboratories at Fort Belvoir, Va. He replaces Col. H. Milwit who is scheduled for duty in the Far East.

A graduate of West Point, Col. Sykes brings a varied experience to his new job. Included are a year in river and harbor work in Galveston; service with the 13th Engineers at Fort Belvoir and with the 2nd Engineers at Fort Logan; four years in the Canal Zone one in military construction; and three years as Chief of Operations with the office of Engineer, GHQ, in the Philippines and Japan. He served three and a half years on the staff of the Munitions Board in the office of the Secretary of Defense and two years at the office of the Chief of Engineers.

Military Surveying and Mapping Instrument Research

By WILLIAM C. CUDE

ENGINEER RESEARCH AND DEVELOPMENT LABORATORIES, FORT BELVOIR, VA.

IN A NATION founded on the principles of peace and liberty for all, it has been quite natural that the United States should traditionally confine its interests in military matters to defense of its own possessions and extend its efforts in this direction only to the minimum considered absolutely necessary. In keeping with this policy, it has always been the objective of those concerned with the equipping of the military forces to utilize commercial items to the greatest extent possible and to modify or develop new ones only when the military requirement could not be met otherwise.

This conception is still applicable; however, beginning with the years when world aggression was recognized as the definite objective of certain countries of the world, and based on the conviction that we could no longer withdraw ourselves from the affairs of the world as we had unsuccessfully tried to do after World War I, consideration of military operations away from our own country became necessary. This had then, and continues to have now, an effect on the activities of, and the equipment for, surveying and mapping. Although one has the feeling that the action is comparable to curing a "corn" or ingrown toenail by cutting the leg off, we must admit that the occurrence of World War II and the events following have had a beneficial effect on the progress of surveying and mapping, in general, and the instruments and techniques used, in particular.

I feel that I could devote considerable space to the fact that in no war up to the present time (and this could also apply to many peaceful activities), have the capabilities of surveying and mapping been exploited to anything like the maximum potential. We should not, however, attribute the lack of advancement in surveying and mapping over the past years to the obstinate attitude of those unfamiliar with the subject and feel that it takes a war with all its suffering to bring about some action from such people, but rather we should consider to what extent we have failed to present the facts and properly sell the matter.

When, at the very beginning of World War II, military action within our own country was considered quite possible, there was great consternation and surprise when the facts showing the inadequacy of mapping within the United States were realized. The situation is, of course, much better now but we must remember that, unless we work at it constantly, it will slip backward into the former state again.

IMPORTANCE OF SPEEDY OPERATIONS

As mentioned above, the policy of using commercially available equipment where possible was practiced by surveying and mapping units in the Army in most cases prior to World War II. For example, the commercial 1-minute and 20-second transits, and wye and dumpy levels, were used by all Artillery units, all Engineer construction units, and many topographic units throughout the war. However, in the early 1930's, topographic troops started using the optical-reading one-second theodolites. The basic reason for this was not accuracy so much as speed. This point is one that is applicable quite often and to many things in military use. It also indicates an area where commercial progress and military necessity tend to deviate.

Presented at the Fourteenth Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954. The opinions expressed herein are those of the writer and not necessarily those of the Corps of Engineers.

The optical-reading theodolite was developed in Europe due to a need for more accurate measurements in surveying. This in turn was brought about by the increasing land values and the portion of land available per person. This situation had no such comparative importance in the United States and therefore there was no demand for more precise instruments. However, in the military there is the eternal requirement for speed—most actions are worthless unless they can be accomplished in the specified time. It was evident that, with the theodolites, one reading would replace the repetitive readings required with the transits thus allowing an increase in speed of operations. Also, learning to read the theodolites required less training and skill than reading the verniers of transits and this is always important to military people who have a continuous training problem. The one-second and later the one-tenth-second theodolite became quite popular with the few topographic troops we had prior to World War II and a few were being tried by other agencies. When the war broke upon us, we found ourselves in a dilemma which was encountered many times over during this period in connection with other items. Our source of supply was Europe and most places of manufacture there were either immediately eliminated or soon cut off. Also, our needs out-distanced all requirements existing previously.

The British were very cooperative in sharing their small stocks of theodolites with us, but we were still far from meeting the need. This situation had been partially anticipated a few years prior to the war and work had been initiated with American manufacturers for the purpose of providing a source of one-second theodolites in this country. With the outbreak of the war, this work was intensified. I will not go into the details of what occurred in this work since theodolites have been discussed at previous meetings and have been demonstrated by the manufacturers who worked with us. The general facts are these: The war was over before a quantity of 30 had been produced, but work has continued until we are assured we can produce 1-second, 10-second, and 1-minute optical-reading theodolites; however, we still have little data pertaining to production and cost in quantity.

IMPROVING PRODUCTION

There is a situation here which poses a difficult problem. The cost arrived at for producing one-second instruments in this country using data presently available is many times the cost of the instruments in Europe. This is due to differences in labor costs and lack of production experience. If we could procure enough instruments to get the production experience we could probably lick the labor differential, as we have in so many other things, by superior mass-production methods, even conceding that we are dealing with an article previously produced largely by skilled craftsmanship. In these times of reducing Government expenditures, quantity procurement by the Government to produce the "know how" does not seem feasible. Another way would be by increased commercial use. Although many instruments were brought back to this country in various ways after the war, and representatives of foreign manufacturers have given excellent service in distributing them in this country, the expansion in their use has been gradual. This is to be expected since many of the commercial requirements in this country just don't justify their use. It is our hope that things will be properly guided to eventually result in a more desirable situation.

This same history of events applies in general to levels and other surveying accessories. Another instrument which formerly was considered as a reconnaissance instrument only, and which gave very dubious results due to the unmanageable variations in atmospheric pressure, was the barometric altimeter. Due to military requirements, this instrument and the techniques of its use were so improved that a vast amount of vertical control data adequate for military mapping can be provided by this means and at a speed far above previous methods.

In the photogrammetric or map-compilation field, we have an example of what I

mentioned before, with regard to improved production methods. The multiplex plotting equipment, a European idea and original product, was taken over by both civil and military Government agencies, working with an American manufacturer, with the result that instruments were produced that were adequate in accuracy for the requirements then specified, and superior in both quality and rate of production to that of the Europeans, although not a rate considered adequate for the need at the time.

In map reproduction for military use, we depended almost entirely on commercial items and procedures; however, placing these items in van-truck units for mobility created many problems and caused us to devote considerable effort after World War II to developing presses, process cameras, and so on, which would be more adaptable to military requirements.

In the fields of surveying, map compilation, and map and photomap reproduction, we feel that we are approaching the end in correcting the deficiencies of equipment used in World War II, and that by observance of activities and developments occurring around the world we can continue to improve our equipment and methods and maintain a par as far as present systems go; but, unfortunately, the situation cannot be left there.

Since we all read the papers, we can easily realize, from the world situation and the weapons and tactics of possible future wars mentioned, that surveying and mapping is in for its share of problems.

It is elementary that the more mapping of territories of the world that can be accomplished prior to a war the better off we will be. And then the more rapidly we can map and the less the effort required, the better chance we have.

APPLYING NEW METHODS

Since requirements of distance and direction for future conflicts will evidently demand the greatest precision as well as the greatest speed, we must add this to our objectives. With this in mind we feel that we must push on into the unconventional, unorthodox, and at times unheard-of methods in connection with our research and development in order to speed up present surveying and mapping methods and provide for more accurate results with less effort in the future.

The development in Shoran used by the Air Force both for line crossing and for mapping control is an example of an effort in this direction which is beginning to pay dividends. However, this method at the present time shows most promise at distances of from 50 to 275 miles with possibilities for 500 or more miles. We have need for greater precision in the 0 to 50 mile range also.

In connection with distance measurement, we are trying both pulsing and phase-changing electronic systems and the Signal Corps is developing a system for us also. The geodimeter, fully discussed at this meeting, is an attempt to solve this problem using the speed of light.[1]

We are already making very good use of helicopters, not only as a quick means of transporting personnel to relatively inaccessible places, but also in connection with triangulation and leveling.

We are exploiting the latest advances in automatic computing equipment in an effort to produce something capable of reducing computation time to a matter of seconds.

As a long-range proposition, we also are studying the phenomena of the natural elements close to the earth along with our tests of new equipment in the hope of accumulating sufficient data to form some pattern on which to devise an instrument or instruments to harness or put to work the phenomena for improved surveying.

In discussing these things there will be, I am sure, a tendency to think that surveying and mapping equipment of the past and present will soon be outmoded. This, I am sure, will not be the case. The new ideas will be used in some places and will gradually be improved, but it will be a long time before the practice is universal. After all,

[1] *See* "Surveying with the Velocity of Light" in this issue.

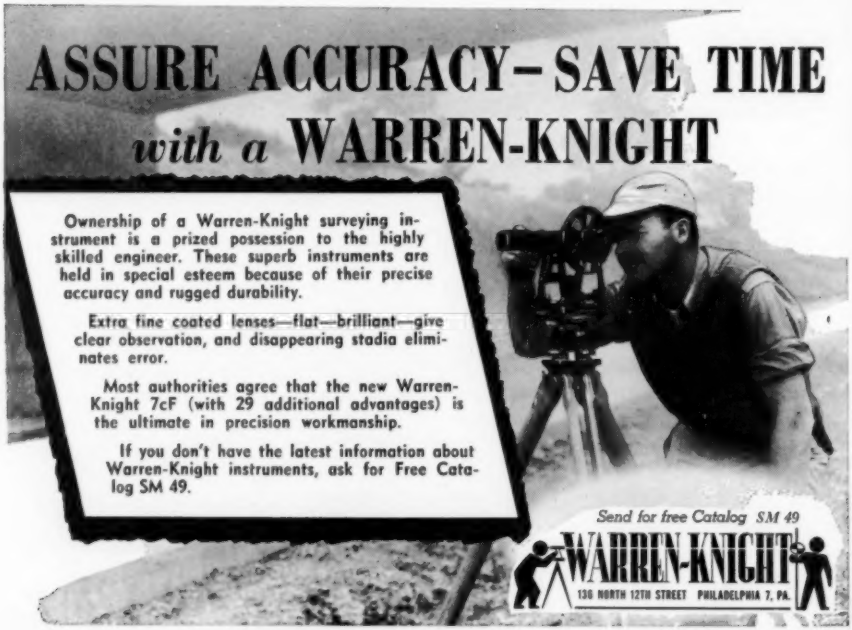
UNIVERSITY OF WINDSOR LIBRARY

although the automobile came into being at the beginning of the century and soon became one of the accepted modes of travel on roads and across country, the U. S. Army still had horse-drawn units in World War II and, if my information is correct, the Corps of Engineers were the last to give up the old Army mule.

Craftsman Press
INCORPORATED
Map Lithographers
—Quality map reproduction
—Negative engraving
—Photo copying
415 ELEVENTH ST., S.W., WASHINGTON, D. C.
Telephone: STerling 3-0444

LOS ANGELES SACRAMENTO SAN FRANCISCO
Porter, Urquhart & Beavin
Consulting Engineers
415 FRELINGHUYSEN AVE., NEWARK 5, N. J.
Surveys, Maps, Soils and Geological Investigations, Design and Supervision of Construction
NEWARK NEW YORK BALTIMORE

ASSURE ACCURACY—SAVE TIME
***with a* WARREN-KNIGHT**



Ownership of a Warren-Knight surveying instrument is a prized possession to the highly skilled engineer. These superb instruments are held in special esteem because of their precise accuracy and rugged durability.

Extra fine coated lenses—flat—brilliant—give clear observation, and disappearing stadia eliminates error.

Most authorities agree that the new Warren-Knight 7cF (with 29 additional advantages) is the ultimate in precision workmanship.

If you don't have the latest information about Warren-Knight instruments, ask for Free Catalog SM 49.

Send for free Catalog SM 49
WARREN-KNIGHT
136 NORTH 12TH STREET PHILADELPHIA 7, PA.

A Motorized Packer[1]

A MODERN powered carrier to substitute for the age-old "pack on your back" has been developed to solve transportation problems in the forests and mountains. After five years of research and experimentation, the Merry Packer is now available for hunters, fishermen, campers, rangers, miners, geologists, foresters, loggers, trappers, guides, surveyors, prospectors, mountain search and rescue teams for aircraft and similar mishaps, construction and maintenance by public utilities in remote areas, and farmers and orchardists.

Maneuverable under the most difficult conditions, the packer is operated by two men, the operator at the rear and a lead man to guide it. (*See* fig. 1.) The machine requires no trail and

FIGURE 1.—The packer, loaded and ready to go.

needs only to maintain traction to climb grades in excess of 35 percent, to surmont logs or ordinary dirt and debris, or to travel on level terrain.

A load capacity of 500 pounds not only enables a greater load to be packed into inaccessible areas, but also assists operators in their climbs and outdistances men or pack animals carrying burdens.

The Merry Packer was engineered for simple operation and minimum maintenance. Powered

FIGURE 2.—The packer, disassembled for transport or storage. Disassembly is accomplished simply by loosening two turnbuckles, unhooking the cable, and removing the two cable supports.

by a lightweight, 4-cycle continental engine of 2½ horsepower, it gives an average of 16 miles per gallon. The machine can be transported to a foot-travel site in a folded condition either under its own power or by conveyance. The sturdily constructed, all steel, welded, flexible frame has a low center of gravity. The fully pneumatic deep-lugged tire is mounted on a centrally placed single wheel. Steel fabrications support load weights. Finger-tip clutch control provides adjustable forward speeds of 2 to 5 miles an hour. Other specifications are: length, overall, 98 inches; width, overall, 27 inches; height, overall, 33 inches; weight, empty, 105 pounds; load capacity, 500 pounds; tire size, 14 by 4.50 by 6; 2-quart gas tank. Extras available are canvas liner for enclosing sides and ends, retractable starter, winch, fire extinguisher, engine silencer, 5-quart gas tank. Disassembled for easy transporting by car or other conveyance, the Merry Packer measures 15 inches high, 54 inches long, 27 inches wide. (*See* fig. 2.) Rescue workers, hunters and fishermen, forest rangers, and prospectors report favorably on their use of the machine.

[1] The machine, called the "Merry Packer" is manufactured by the Merry Manufacturing Company of Edmonds, Wash. and is distributed by Gwin, White, and Prince, Inc., Skinner Building, Seattle, Wash.

Recent Developments in European Instruments and Survey Techniques

By CAPT. O. S. READING

U. S. COAST AND GEODETIC SURVEY

IN THE FALL of 1953 the writer attended the 8th International Congress of Surveyors in Paris and a two-week course in Geodetic Distance Measurements at the Technical University at Munich. He also visited leading surveying and mapping organizations in France, Germany, Switzerland, The Netherlands, and England.

No American could see the instruments and survey organizations the writer saw on this trip without coming back full of enthusiasm for the instruments and for the future of surveying and mapping in America, as well as in Europe. There are a number of new instruments available or now being developed which should increase the efficiency and precision with which our work can be done by twenty-five to several hundred percent over those now commonly in use. Fortunately, several of these instruments are on exhibit at this ACSM meeting. Some of the surveying and mapping being done in Europe is equally inspiring. In order better to explain what was observed, some illustrations of these most outstanding instruments are presented with brief comments on their advantages.

NEW EUROPEAN INSTRUMENTS

Figure 1 shows the Zeiss Ni-2 automatic second-order level.[1] With this level it is practicable to surpass greatly the output of the ordinary spirit levels of equal precision. It is not necessary to use an umbrella to protect it when working in the sunshine. Closures of three one-hundredths of a foot per mile are readily obtained with it. Some of the earlier models of this instrument had very fine clearances in the damping mechanism of the pendulum mirror which caused some sticking in service. In fact, three of these earlier instruments belonging to the Coast and Geodetic Survey are now being overhauled at the factory. It is understood that this overhaul will eliminate the sticking. Meanwhile the field parties who used them are writing our Washington office to learn when they can get their instruments back.

Figure 2 presents the Bergstrand geodimeter, an electro-optical apparatus from Sweden which measures the time required for light to travel between the instrument and a reflecting mirror.[2] The mirror can be from 10 to 20 miles away under favorable conditions. The instrument is reported to be capable of measuring with a precision of one part in 500,000 to one part in several millions. It operates on the principle of phase difference measurements by means of a Kerr cell between the distant light and a base built in the instrument itself. The Coast and Geodetic Survey and the Engineer Research and Development Laboratories have been cooperating on tests of these instruments during the past year. Coast and Geodetic Survey field tests have given agreement of 1:500,000 or better between measurements on two different nights' observing. Each night's observations requires a period of 2 or 3 hours. Although the instrument, as it is at present, will not replace triangulation, it will very probably eliminate many base expansion nets and base measurements with tapes in the future.

Figure 3 illustrates another type of distance-measuring electro-optical instrument that is being developed at Frankfurt, Germany, in Dr. Gigas' laboratory for geodetic research. This instrument is intended to

Presented at Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954.

[1] *See* "The Zeiss Opton Ni-2 Automatic Level," SURVEYING AND MAPPING, April–June 1954.

[2] *See* "Surveying with the Velocity of Light" in this issue.

be used on traverses for distances of 200 to 2,000 meters with a precision approaching 1 part in 100,000. This instrument also measures light reflected from a mirror but is much smaller and lighter than the geodimeter and is intended for use on the usual traverse survey tripods. The electro-optic traverse instrument replaces the theodolite which measures the angles of the traverse and its mirror replaces the illuminated azimuth mark on the other tripods. The instrument works on the principle of varying the wave length of the light used by one unit. This is done five times and the five equations thus obtained give a multiple check on the value of the distance. The Askania Company of Berlin is manufacturing a field model and hopes to have it ready for the exhibition at the Geodetic Congress in Rome in the fall of 1954. If successful, this instrument will go far toward an economical solution of the problem of breaking down first-order triangulation to readily accessible monumented stations at close intervals.

FIGURE 1.—Zeiss automatic level Ni-2.

Figure 4 shows one form of the Watts traverse gear. This apparatus consists of three tripods having interchangeable theodolites, targets, and taping heads. This interchangeability gives practically perfect centering. The optical plummet on the

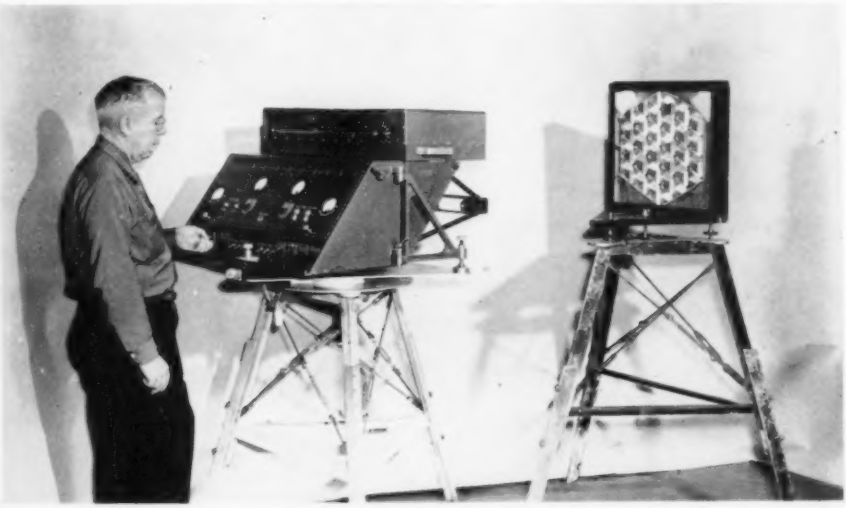


FIGURE 2.—Bergstrand geodimeter.

theodolite is capable of centering over a monument within 1 or 2 tenths of a millimeter. The theodolite reads to the nearest second. This apparatus is capable of giving precision of 1 part in 10,000 to 30,000 with only ordinary care, if properly standardized tapes with temperature and tension corrections are used. Similar apparatus is made by Wild and Kern in Switzerland.

FIGURE 3.—Electro-optic traverse instrument.

Figure 5 shows the Wild self-reducing tachymeter. This instrument reads the direct horizontal distances and elevations with a precision of 1 or 2 centimeters from inclined sights up to 150 meters in length. It uses a carefully leveled and pointed horizontal rod supported on a tripod stand. Such instruments are widely used for cadastral surveys of rolling terrain in continental Europe. Precision of one part in 5,000 to one part in 10,000 is obtained if care is used. About 20 to 25 set-ups or two miles of traverse per day is the usual output. Similar equipment is made by Kern in Switzerland and Zeiss in Jena.

Figure 6 presents the latest Kern planetable outfit. This outfit nearly doubles production of large-scale planetable mapping. It reads direct horizontal and vertical distances by varying the interval between the stadia lines in the telescope as the line of

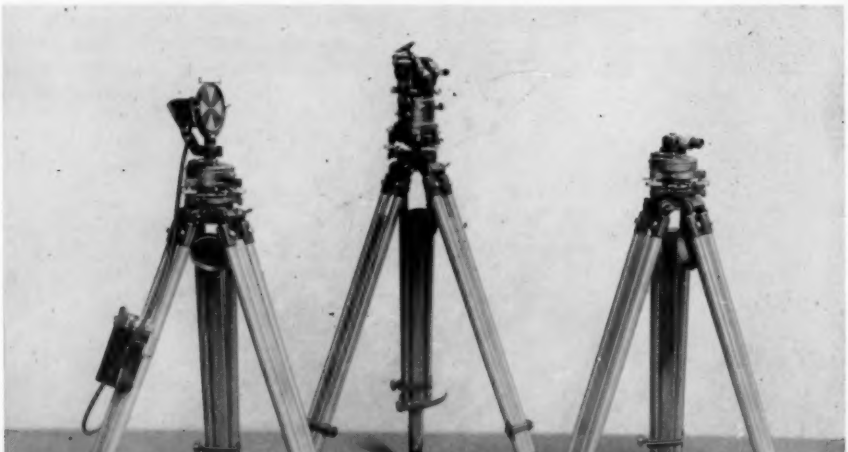


FIGURE 4.—Watts traverse equipment.

sight is inclined. It is capable of reading correctly to one decimeter for sights up to 100 meters. A very ingenious azimuth tangent screw, a parallel-motion straight-edge and pricking device, and a quick-leveling tripod head all combine to speed production with this ingenious outfit.

Figure 7 illustrates the Roelofs solar prism attachment. This attachment is intended for use on optical theodolites reading to one second or better. The attachment makes it possible to point on the sun's image with a precision of 1 to 5 seconds, thus avoiding the necessity of waiting for Polaris observations to obtain second-order azimuths. Some experiments indicate that, with sufficient repetitions, it is capable of measuring first-order azimuths. At any rate it is so satisfactory that when an effort was made to have it transferred from one field party to another, the party using it always found some urgent work so that it could not be spared.

Figure 8 shows the Stereotope, a third-order mapping instrument for use with contact prints of nearly vertical aerial photographs. This instrument has an automatic compensating apparatus, which is readily set by adjusting four screws to make spot heights near the four corners of the stereoscopic model read correct values. The instrument will then plot automatically the map positions with sufficient precision for mapping at the scale of the photographs, it is claimed. A paper describing the residual errors remaining under various conditions of tilt, etc., has been promised for early publication by the manufacturers, Zeiss-Aerotopograph. The optics of the viewing stereoscope are excellent and it is not necessary to hold the head still while tracing from the photographs. Four-power wide-field binoculars are furnished. An automatic device adjustable so that the desired contour interval can be set directly is obtainable as special equipment.

Figure 9 illustrates the Klimsch Variomat, a device for holding the thickness of lines constant while reducing or enlarging a positive copy in a copying camera. The device is also useful in avoiding patterns when copying half-tone illustrations. It operates by rotating a plane-parallel plate which can be tilted in front of the lens of the copying camera by the amount necessary to give the desired small displacement of the image.

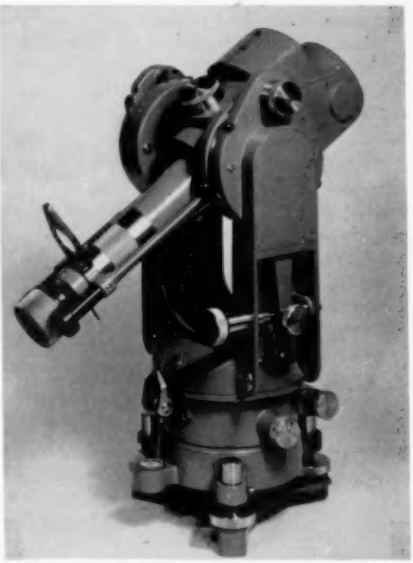


FIGURE 5.—Wild self-reducing tachymeter

Figure 10 shows the standard first- and second-order station monument of the Ordnance Survey of Great Britain. This is not an instrument but it is used as an instrument stand. Note that it contains about a cubic yard of concrete. This illustration is shown to give some idea of the importance with which survey monuments are regarded in Great Britain. It also demonstrates the amount of use and the value to be obtained from such stations for future surveying in Great Britain.

EUROPEAN COUNTRIES ARE WELL MAPPED

This brings me to the second and more important part of this paper. Considering the present state of surveying and mapping in the United States as compared with the rest of the world, and with Europe in particular, it is very plain that the better the surveys and maps a country has, the more they want and the more they are willing to

spend on still better surveys, still more up-to-date maps. Switzerland and the British Isles are the best surveyed countries in the world. Switzerland has 80,000 monumented survey points, whose coordinates are known within one decimeter of their correct values, in an area of 16,000 square miles—or about 5 per square mile. Yet she has over 500 professional registered surveyors, plus their helpers, completing and keeping up-to-date her excellent series of cadastral maps on scales ranging from 1:200 to 1:10,000 depending on the use of the land.

The Ordnance Survey of Great Britain has recently completed a new first- and second-order triangulation and now has about 6,000 men employed in mapping towns and thickly settled areas on a scale of 1:1,250 with the rest to be mapped on a scale of 1:2,500 with the exception of waste lands on 1:10,000. A very efficient organization has been established for keeping the maps current, once a new sheet is completed. A permanent survey party of three men is established in each unit area. This team keeps track of the changes as they occur, through local contacts and examinations,

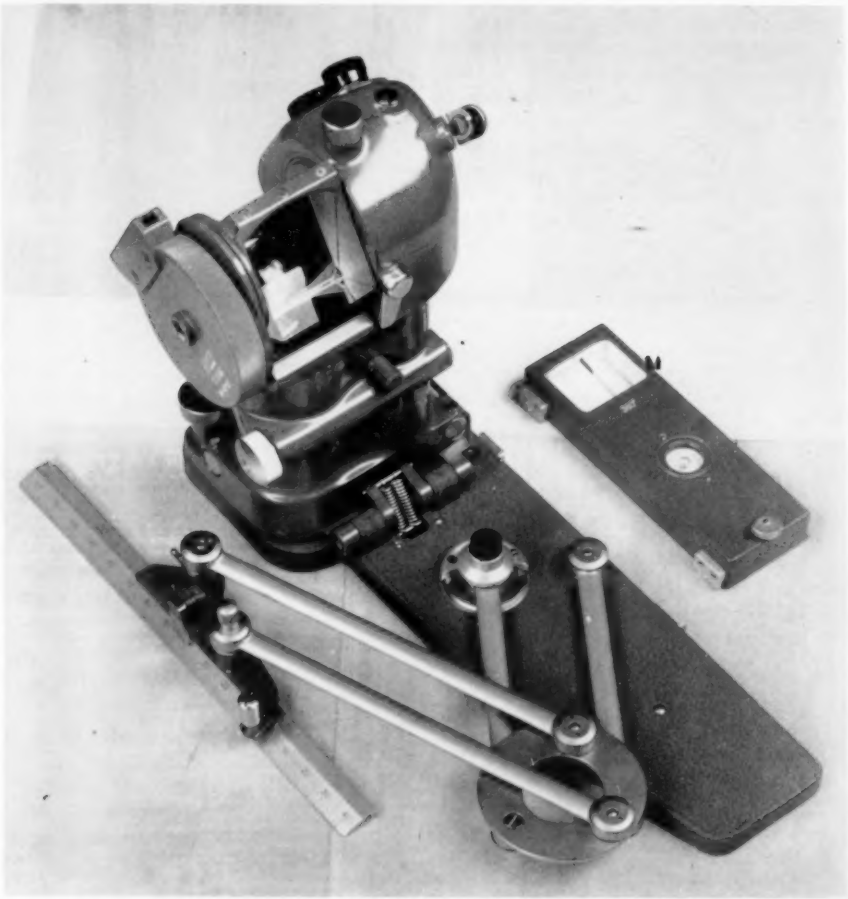


FIGURE 6.—Kern self-reducing planetable alidade.

then surveys the changes before they accumulate to more than 3 days' work per sheet. The surveys are plotted on metal plates die-cut to exact size so that they can be assembled to cover any desired area with negligible errors. A very efficient P.V.A. reproduction process whereby only the changed areas have to be redrafted when the new maps are issued has also been worked out.

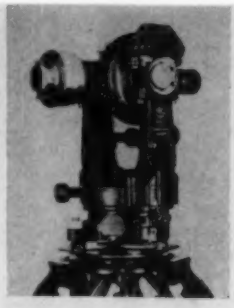


Fig. 36. Solar prism attachment fitted in front of the objective of a theodolite (position when pointing at the Sun).

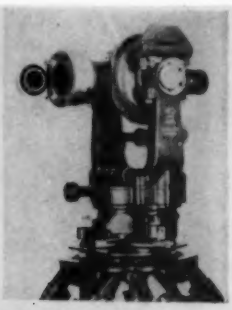


Fig. 37. Solar prism attachment fitted in front of the objective of a theodolite (position when pointing at a ground mark).

Courtesy Kern & Co, Aarau, Switzerland (theodolite) and C. J. van Leeuwen, Delft, Holland (attachment).

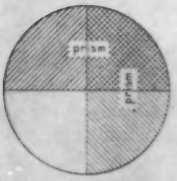


Fig. 38. Position of the prisms in front of the objective.

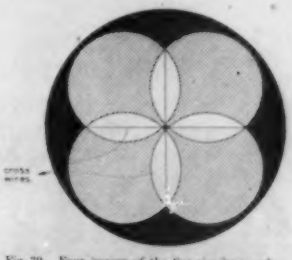


Fig. 39. Four images of the Sun simultaneously in the field of view of the telescope.

FIGURE 7.—Roelofs solar attachment.

Although Switzerland and Great Britain are somewhat in the lead, nearly all the countries of Europe are better mapped in proportion to their wealth and population than the United States.

GEODETIC CONTROL FOR PROPERTY SURVEYS

The necessity of having geodetic control for adequately coordinating private property as well as all other types of surveys is recognized both in Europe and the United States. But the geodetic control must be broken down to adequately small spacing and adjusted in unit areas to cash in on this efficiency. This has been done in the United States only in a few cities and special projects. A few years ago, for example, engineers in Boston used geodetic triangulation on plane coordinates to locate the holding-down bolts in the foundations for the steel of an overhead expressway with marked efficiency.

On March 3, 1954, at the University of Maryland, there was a most interesting meeting in which surveyor after surveyor testified about how glad he would be if the geodetic control stations in Maryland were only close enough for him to tie his land surveys to the State plane coordinate system and how much more permanent value his surveys so coordinated would have in the future. Others testified to the value of the State plane coordinate system for the coordination of underground sewers, and gas, water, and electric services and to the necessity for such coordination in carrying out any extensive engineering development.

The spacing of geodetic control so that the benefits of State-wide plane coordinates can be efficiently obtained is about ½ mile in cities, 1 mile in towns, 2 to 7 miles in cultivated areas, and much wider spacing in mountains and desert areas. England and Switzerland have greater density of control than this, yet many of our areas sell for as much as corresponding land in those countries. How can such a spacing of geodetic control with its many advantages be obtained for the United States? What does European experience (where they have

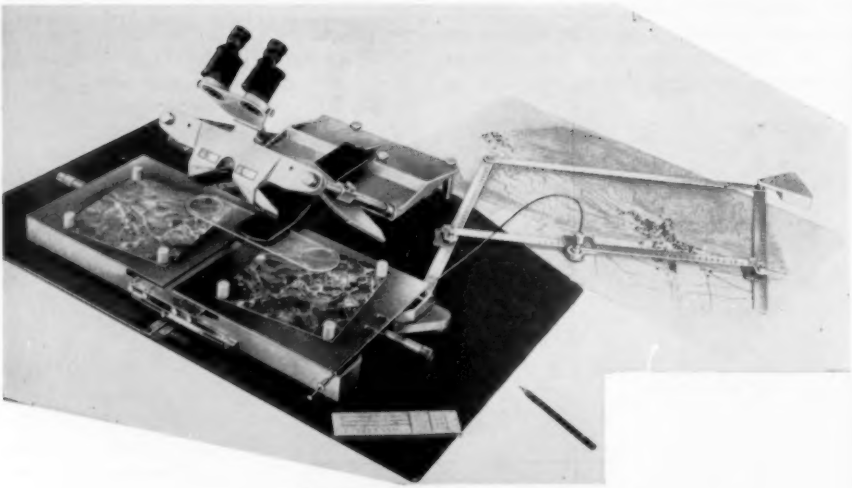


FIGURE 8.—Zeiss "Stereotope."

achieved or are achieving these advantages) tell us?

To start with, each country has gone about coordinating its property surveys on its geodetic control in a different way, depending on the way its people expect their government to serve them. In Great Britain, all the work has been done by the Ordnance Survey, a national organization. A select committee from the British Parliament studied its work then recommended the appropriations to carry out the large-scale surveys made by that wonderful institution. In Germany, the war broke up the German Reich Land Survey but in each of the reorganized German States one of the first institutions to be reorganized and have its bombed buildings rebuilt has been its Land Survey. They are now local-government institutions but are doing excellent work using modern scientific procedures and modern apparatus as fast as they can procure it. In Switzerland, the cadastral surveys and third- and fourth-order control work are done by licensed private professional surveyors under contract for the Government Cadastral Survey. Very fine specifications and a sliding scale of prices according to the difficulty of the work have been negotiated between the Government Survey officers and the Surveyors Association. Each of the private surveyors has obtained a license after serving a two-year apprenticeship and passing a very strict practical examination in which he not only has to do several accurate small surveys on the ground but also has to answer the theoretical questions of an examining committee composed of representatives of the Surveyors Association, university professors teaching surveying, and government survey officials. The prices he gets for his contract work are not fixed by competitive bidding but are set on the level of other professional services and incomes.

THE PATH TO COORDINATED SURVEYS

In thinking over the various ways of getting the benefit of adequate, coordinated surveys in the United States, it seems to me that the very democratic Swiss system with its professional-status private contracts best fits our ideas of the way to do the work and the best way of handling the relations between our government and its citizens. But how are we to get the necessary professional training and proficiency in our private contractors?

My trip gave an answer to that question also. I attended a two-week short course

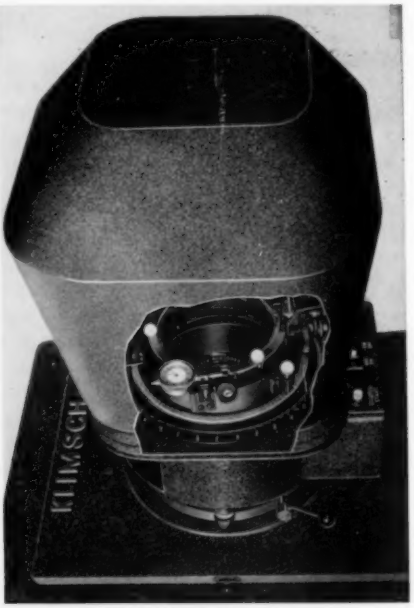


FIGURE 9.—Klimsch Variomat.

in Geodetic Distance Measurements, along with some 140 other professional surveyors, at the Technical University of Munich. At this course, the mornings were spent listening to the leading instrument designers of Europe and university professors of surveying, as well as government engineers, explaining just what the latest instruments would do and how to avoid errors and get the best performance out of the instruments. The afternoons were spent in individual examination and use of the instruments in the field laboratory, with the same men available to demonstrate what they were talking about. There were collimators and monuments with known coordinates so that those who wanted to do so could get some checked practice. Such short courses are very effective in bringing busy men up to date on the latest scientific instruments and the most efficient ways to work.

Now, what can we American surveyors do about it? I feel sure the Coast and Geodetic Survey and other Government agencies would be glad to organize such short courses in the latest instruments and methods in connection with the annual meeting of the ACSM next year. Your university professors who do not have such instruments can take such a course and then, with your backing, and fire in their eyes, they can go back to their college presidents and get the equipment needed to give such courses at your State or local universities.

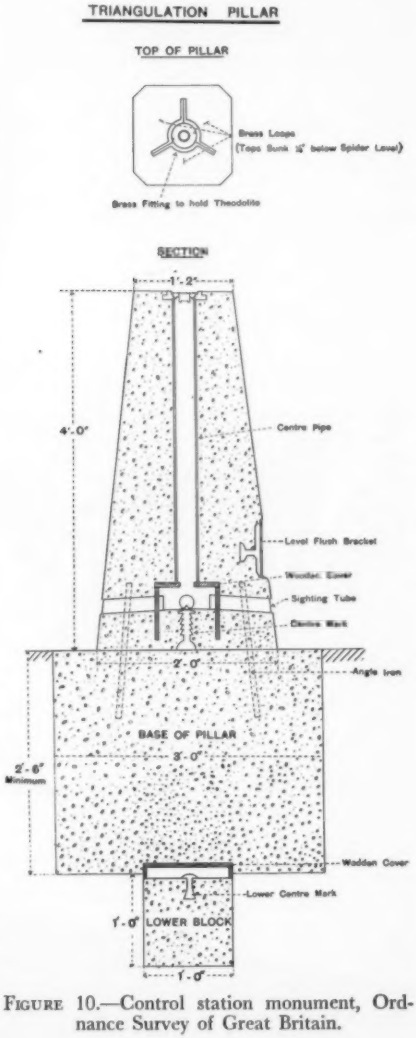
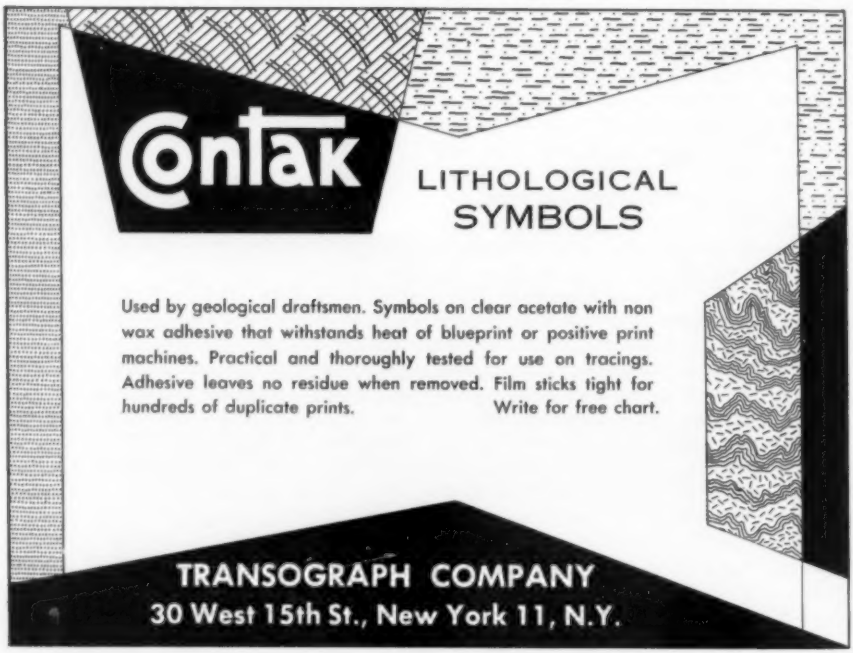


FIGURE 10.—Control station monument, Ordnance Survey of Great Britain.

Developing the theory of geodetic surveying is a special career, but the practice of doing the best, most efficient second- and third-order work can be readily learned by almost any practicing surveyor from such courses, given the instrumental equipment and the lesson material. The successful work of the P.W.A. control-survey program in several States during the last depression, as well as our every-day experience in breaking in new men on our geodetic survey parties, demonstrates this.

The path to highly efficient coordinated surveys of private property and a real professional status for the surveyor in the United States is clear. Write to the Maryland Bureau of Control Surveys and Maps, 305 Tower Building, Baltimore 2, Md., for a copy of the proceedings of their March 3, 1954, conference on the use of State plane coordinates. This will give you the sales-talk data. Demand a short course in the latest instruments and techniques from your ACSM officers or your State university if it is prepared to give one. Then, knowing what you want to do and how to do it, we can talk with our local, State, and national political officials and sell the need of geodetic control spaced closely enough to really help you attain the professional efficiency and status private property surveyors should have. You will attain this status because of the help the more efficient methods will give to the development of our country.

In the United States we do too much short-range thinking; we and our children are here to stay for a long time; we surveyors have a great future ahead of us in promoting the growth and development of our country. Let us not stand for slowing down this development with uncoordinated private property descriptions and inaccurate surveys. Remember that worldwide experience shows that the better the surveys and maps a country has, the more it wants and the more it is willing to spend to get them.


Contak
LITHOLOGICAL SYMBOLS
Used by geological draftsmen. Symbols on clear acetate with non wax adhesive that withstands heat of blueprint or positive print machines. Practical and thoroughly tested for use on tracings. Adhesive leaves no residue when removed. Film sticks tight for hundreds of duplicate prints.
Write for free chart.
TRANSOGRAPH COMPANY
30 West 15th St., New York 11, N.Y.

Cartographers and the Civil Service

By ERNEST J. STOCKING

U. S. CIVIL SERVICE COMMISSION

I DOUBT that there is anyone in this gathering who does not know more about cartography, map making, and related activities than do I. My education and experience has been in the field of civil engineering and I have for many years used maps and charts and have worked on surveys preliminary to the design and construction of city pavements, sewers, drainage ditches, and rural highways. I do not claim, however, that such activities have qualified me as a map surveyor, compiler, and maker. I do have some knowledge of the techniques, instruments, and controls used in mapping and of the processes involved in the making of the many specialized types of maps, but it is not the intimate type of knowledge you possess.

My purpose in presenting this paper is not, therefore, to instruct you in the occupational area of your specialty but rather to present for your consideration some observations about the classification of positions in the general field of cartography. I wish also to discuss recruiting standards both for professional and sub-professional positions in the fields of surveying, mapping, chart making, and closely related cartographic activities.

RECRUITMENT STANDARDS FOR CARTOGRAPHERS

As many of you are aware, the Commission has during recent years made a number of surveys and studies for the purpose of setting guide lines and establishing standards for the classification of cartographic and related positions in the Federal service. The information developed in those studies also serves as a basis for establishing recruitment standards for filling such positions. The Commission in its studies did not set out to prove some previously conceived ideas as to the proper allocation of technical positions in the general field of mapping. What the Commission did do was to gather a great deal of pertinent information about the duties of a variety of positions in the field of mapping and map making. Because the United States Government has a number of large mapping programs, there was made available to the Commission by the Federal agencies a great deal of material. An objective study of this material led to the conclusion that here was a field in which engineers could furnish leadership and in which engineering talents could be used successfully, but a field that had developed to such extent, that had become so specialized, and that had developed so many techniques of its own that it had emerged as a profession in its own right. It was obvious, as in any profession, that there were persons engaged in mapping activities who were doing high grade professional work, some doing sub-professional work, and still other auxiliary employees performing important technical but non-professional work. However, the evidence is that much of the work being done in the field of surveying and mapping cannot be considered professional engineering work and the successful performance of the duties does not require a person with professional engineering training.

A review of the sources of recruitment for personnel used by mapping agencies leads to the same conclusion. We have found that much of the personnel used is trained by the mapping agencies. Many of those so trained have not completed four years of formal scientific education in engineering and they do not need such education in order to perform successfully the duties to which they are being assigned. Additional personnel have been recruited from the fields of forestry, geography, physical sciences, etc. To the extent possible,

Presented at the Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954.

engineers have been recruited for some positions but even there such personnel are not necessarily assigned strictly professional engineering duties once they are recruited.

Let me make it quite plain that the Commission is not in any way belittling surveying, mapping, or cartographic positions when it states that they are not professional engineering positions. It recognizes the importance of many of the positions by permitting the classification of the positions as high salaried professional positions. The duties and responsibilities of many of the positions in the field of cartography, however, do not fit the Commission's definition of a professional engineering position. The fact that many persons are serving successfully in cartographic positions who do not have the scientific training given to persons pursuing a professional engineering course at a college of recognized standing indicated further that a different approach to the titling, defining, and allocation of such positions is desirable, if not necessary. You probably have noted that a limited number of colleges observing the same trend and the need for special training in the field of surveying and mapping are now offering specialized courses in that general field, which courses are not necessarily considered engineering courses, but do lead to a degree in surveying and mapping.

WHO IS AN ENGINEER?

The following definition established for professional positions in the GS-800 Engineering Group is quoted from the Commission's Handbook of Occupational Groups and Series of Classes Established under the Federal Position-Classification Plan. This definition governs the allocation of any position to a professional engineering series in the GS-800 Engineering Group:

> The professional and scientific service shall include all classes of positions the duties of which are to perform routine, advisory, administrative, or research work which is based upon the established principles of a profession or science, and which requires professional or technical training equivalent to that represented by graduation from a college or university of recognized standing.

Professional engineering curricula as offered by colleges and universities of recognized standing comprise (*a*) a basic foundation, particularly in the mathematical and physical sciences, the most important of these being higher mathematics, physics, and chemistry; (*b*) subsequent courses indicating the special application of such basic sciences to engineering in general, such as engineering mechanics, engineering materials, hydraulics, thermodynamics, etc.; and (*c*) terminal courses consisting of the more specialized professional courses developing the direct application of previous courses to a particular branch of engineering. Therefore, a professional position in a recognized branch of engineering comprises duties a preponderance of which require in their successful performance: (1) the practical application of basic scientific principles, particularly those of higher mathematics, physics, and chemistry; (2) an intimate knowledge of the fundamental engineering concepts and terminology, the units of measurements, and their inter-relationship common to all branches of engineering; and (3) a thorough understanding of engineering techniques as can be gained through four years of engineering training in a recognized college or university, or training equivalent in type, scope, and thoroughness.

In consideration of this fundamental classification requirement, a position may not properly be allocated to a professional engineering series unless the duties are of such nature that, for successful performance, the same knowledges and skills developed in a person with a bachelor's degree in engineering are needed.

Further, since the branch of engineering most often associated with cartographic surveying and mapping work is civil engineering, it is desirable that there be an understanding as to just what constitutes civil engineering in the Federal service.

The Commission's definition of the Civil Engineering Series, GS-810-0, is as follows:

> This series includes all classes of positions the duties of which are to advise on, administer, supervise, or perform professional and scientific engineering work in two or more such unrelated branches of civil engineering as (1) the conservation, development, control, and treatment of water; (2) the structural design, lay-out, construction, or maintenance of structures, including highways and airports, dams and locks,

buildings, docks and piers, and underground shelters; (3) provision for facilities for coverage and sewage treatment and disposal; (4) the properties and economic utilization of construction materials; and (5) soil mechanics as related to foundations, earth dams, stability of slopes, and other earthwork problems. Positions involving the application of civil engineering principles within a single specialized branch of related work, such as hydraulic engineering or structural engineering, are included in the series covering that branch.

In the words of Harold E. Wessman, Engineer with Waddell & Hardesty, Consulting Engineers, New York City: "In our modern age, the term 'civil engineer' does not mean much in itself because of the large number of specialties into which the field has become divided. These specialties are described in other chapters of this book by men who have made their reputation in one particular branch, such as bridge engineering, water-supply engineering, etc. One man can hardly hope to become an expert in more than one or two of these subdivisions, even though there is considerable overlapping in certain phases of the work done in each branch. And yet it was less than a century ago that the term 'civil engineering' covered the entire range of practice, except that of military engineering."

Historically, civil engineering included the building of temples, pyramids, roads, bridges, docks, seawalls, sewers, water-supply systems, railroads, and other structures. With scientific developments increasing rapidly, mechanical, electrical, mining, and chemical engineering emerged as distinct fields of engineering. Still later other specialized branches emerged such as construction engineer and structural engineer. But in all of these specialized fields the author says that the engineer thinks in terms of the "required structure," the plans and specifications that show not only how every unit is to be built but the materials of which it is to be constructed, and usually the methods to be used.

WHO IS A CARTOGRAPHER?

The Cartography Series, GS-1370-0, is defined as follows:

This series includes all classes of positions the duties of which are to administer, supervise, or perform research or other professional and scientific work in the mapping and charting of the physical features of the earth's surface. Such work requires a knowledge of physiography, the mathematical and analytical laws upon which surveys, maps, and charts are based, and the techniques of expressing graphically, by means of charts and maps, accurate information which will lead to a better understanding of the earth's terrain and the sea, their history and relationship, and their characteristics and phenomena.

The Cartographic Aid Series, GS-1371-0, is defined as follows:

This series includes all classes of positions the duties of which are (1) to perform, in the construction of maps, technical work in the collection, evaluation, interpretation, and presentation of exact, or related, data on topographic or geographic positions, levels, limits, and bounds, and variations of terrestrial gravity; extent and condition of land areas; contour of the bottom of a harbor or other body of water, depth of soundings, and position of channels and shoals; configuration of a surface, including relief and erosion, position and character of land use, streams, lakes, roads, cities, or other map and chart information; or (2) to supervise technical work involved in the construction of cadastral plans, planimetric, topographic, and various special-purpose maps, and nautical and aeronautical or other charts excepting those intended for pictorial presentation.

NEED FOR REVISED STANDARDS

The Commission is continuing its study of all mapping and related types of positions and is discussing the problems involved with agency personnel. As further study and discussion are still in order, I cannot say at this time what the ultimate decisions will be. This I know, we of the Commission are still of the opinion that the field of surveying and mapping is a distinct profession of its own and entitled to a classification series. We are equally convinced that the Commission must reexamine and rewrite its current definitions, criteria, and classification and recruiting standards for mapping positions. They are not entirely satisfactory either to us or to the agencies at

the present time. This rewriting of standards for the classification of professional surveying and mapping positions we are now doing and hope to distribute a draft for comment in the not too distant future.

I should point out in this connection that under the Commission's present organizational structure, the responsibility for standards, both classification and recruiting, is vested in the Bureau of Programs and Standards. Previous to our present organization, allocation standards were the responsibility of the Position Classification Division and recruiting standards the responsibility of the Examining and Placement division. Currently both classification and recruiting standards for cartographic and related positions are the responsibility of a section of the Bureau of Programs and Standards. We believe that having placed the total responsibilities for both types of standards within one organizational unit we will get better coordination of classification and recruiting standards than has been possible in the past. This should materially help both the Commission and the agencies in their recruitment, placement, and promotion programs.

In establishing and promulgating new guide lines and criteria for cartographic positions we will strive to be realistic and will be careful to cover, for classification purposes, those positions which have a common core of knowledge. Also, we will try not to eliminate any source of recruitment that can be expected to produce qualified journeyman workers in cartography and such additional persons as may be needed with background of training or experience as will enable them to absorb specialized training quickly.

In closing may I reiterate that the Commission is fully aware of the importance and complexity of the work done by the field and office man in surveying and in compiling information for maps, and in the processing of those maps. It knows of the need for all types of specialized maps and charts and of their influence in the planning of our present and future industrial, cultural, and business life. It is also aware of the very definite and important part maps and charts play in the Nation's plans for defense. We of the Commission are certain that we can, working cooperatively with representatives of Federal agencies, develop sound, realistic, and understandable standards that will be accepted by us, by the agencies, and by a majority of those engaged in any or all phases of cartography.

Reprints of Articles

Reprints in quantities of 50 or more may be obtained of any article appearing in this issue. Orders must be placed with the Editor-in-Chief, Robert C. Eller, Topographic Division, U. S. Geological Survey, Washington 25, D. C., not later than 3 weeks after publication. Authors who wish reprints of their articles may so indicate when manuscripts are submitted. Approximate prices of 4- and 8-page reprints follow:

	Self-Cover		*Heavy Paper Cover*	
No. of copies	*4 pp.*	*8 pp.*	*4 pp.*	*8 pp.*
50	$12.01	$19.59	$19.08	$26.66
100	$12.48	$20.43	$21.43	$29.38
250	$13.95	$22.94	$28.54	$37.53
1000	$21.30	$35.46	$64.09	$78.25

Prospects For a B. S. Degree in Surveying and Mapping

By MARSHALL S. WRIGHT, SR.

CHAIRMAN, COMMITTEE ON SURVEYING AND MAPPING,
UNITED STATES DEPARTMENT OF AGRICULTURE GRADUATE SCHOOL

Foreword

This paper, as Mr. Wright clearly points out, deals with a subject that has a number of controversial facets and hence should arouse the interest of, and it is hoped some comments from, engineers and educators alike. The present lack of adequate college training for personnel who intend to pursue a career of surveying and mapping is generally acknowledged and several factors that bear on the situation are taken up.

Basically the overall problem has two aspects, both of which are essentially economic in nature. In the first place there is the question of supply and demand for qualified graduates in a rather limited field; and, secondly, difficulties arising from the initiation and administration of additional academic curricula must be considered. Supplementing these two main factors, Mr. Wright next briefly discusses special training programs in the Washington, D. C., area that have been made available through government agencies.. Lastly, he suggests that the American Congress on Surveying and Mapping itself, could, by special studies, do much to foster a better professional development in the neglected areas.

—RAYMOND P. EYMAN

WHEN I originally consented to present this paper, I was quite unaware of the implications, complications, and unsettled opinions that accompany the topic. A multitude of varying ideas lie hidden beneath this innocent-appearing subject. These ideas seem to differ so widely that there may be little common ground on which to frame a serious academic program for young map-makers. An alternate title for this discussion might well be "Problems Involved in Offering Degrees in Surveying and Mapping."

One of the gravest of the problems is the apparently small demand for such academic training with the relatively few opportunities for placement of graduates at attractive salaries. It has been pointed out that the number of individuals employed in the field of surveying and mapping is very small compared to that for construction engineers. It is a matter of record that since the beginning of World War II the demand for graduates in all branches of engineering has been far in excess of the supply. As a result, the young engineer has little difficulty in choosing the type of work that appeals to him. This was not true in the 1930's. The spectacular nature of construction engineering together with the high salaries and opportunities for rapid advancement may have attracted graduates away from the less flamboyant activities of surveying and mapmaking. On the other hand, many engineering graduates have found themselves not fully trained in the more modern techniques of measuring the earth's surface or delineating its physiographic features, and consequently they shied away from an activity which required an extensive knowledge of photogrammetry, geodesy, cartog-

Presented at the Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., Mar. 22–24, 1954.

raphy, and all their related functions. No one will deny, at least in this audience, that surveying and mapping is one of the most intriguing professions, and is especially attractive to one who has the pioneer spirit of adventure. He usually is the first person on the ground and all future local activities are based upon the results of his findings.

It has been pointed out that the membership in the leading professional surveying and mapping association in the United States—namely, the American Congress on Surveying and Mapping—is only about 3,000. Although many of us believe that this figure is in no way indicative of the total number of individuals who earn their livelihood through surveying and mapping, the number is obviously very low.

To proceed further with this idea may seem to be injurious to the future of our profession; nevertheless, I believe that a satisfactory solution of our educational problem may result from a frank discussion of all the factors involved, whatever difficulties may be presented. I hope that this discussion will serve to inform all of us of the peculiarities of the situation and to call forth ideas for an intelligent and effective approach toward a satisfactory development.

SURVEYING AND MAPPING CURRICULUM

Some educators seem to believe that engineering students should not concentrate in any minor field of endeavor during their undergraduate training. Their opinion may be a direct result of the apparently small number of employees engaged in surveying and mapping activities, as well as other factors. Surveying and mapping is, in most instances, taught as a phase of the civil engineering undergraduate curriculum, which is already overcrowded with the essential courses of a broad, balanced training in basic engineering. Perhaps the primary duty of a college engaged in mass education of engineering students is to provide all of them, within the normal time available, with as many as possible of the elementary tools that are essential in every phase of application of the field, such as civil engineering.

A specialized curriculum in surveying and mapping, sufficiently severe, technical, and informative to be regarded as academic matter, could be compiled from the extensive published material on the subject. The courses and ideas are so voluminous that it would not be possible to include all of them in a normal four-year program where sufficient time is also to be allotted to such essentials as English, mathematics, drafting, physics, chemistry, economics and the humanities. The special subjects would conceivably include:

- Topographic surveying
- Geodesy
- Photogrammetry
- Cartography
- City planning
- Highway planning
- Property surveys
- Engineering geology
- Electronics in surveying
- Map reproduction
- Photography
- Astronomy
- Map projections
- Geography
- Route surveying
- Earthquakes and seismology
- Optics
- Soil mechanics
- Hydraulics
- Natural resources

It is realized that at least seven of these outlined subjects are usually included in most engineering schools, namely:

- Topographic surveying
- Highway planning
- Engineering geology
- Hydraulics
- Route surveying
- Optics
- Soil mechanics

Although a considerable quantity of mapping is done for geographical purposes, the training outlined here is greater than that required by geographers. The types of mapping for which this training is contemplated is generally topographic for engineering use, such as for industry, transportation, mining, and exploration. It is highly probable that, should a surveying and mapping curriculum be established on a campus, some courses would be useful to students of geography, and, vice versa, courses in geography would be useful to students in surveying and mapping.

The idea has been advanced from time to time that complete training leading to a degree in surveying and mapping should be offered by most of the colleges or universities of the country. This is exemplified in courses now given or shortly to be instituted

at Syracuse University, Ohio State University, Cornell University, and several others. Graduates from these schools have been in demand, and a sizeable number of them are now employed in key positions of the Nation in their chosen field. The bulk of the leaders in surveying and mapping operations, however, have "picked up" their training and information as they worked, having had academic training in such courses as civil engineering, forestry, geology, geography, physics, and mathematics.

OPPORTUNITIES IN THE WASHINGTON AREA

Surveying and mapping students in the Washington, D. C., area are very fortunate with regard to available training. A rather complete curriculum of courses at graduate level dealing with the various aspects of surveying and mapping is offered in night-school programs, particularly in the Graduate School of the U. S. Department of Agriculture. Also, as most of the Federal mapping organizations are of considerable size, a relatively large amount of on-the-job training is provided. It is realized that such opportunities for specialized study are not available in areas where map-making facilities are less concentrated.

It is disappointing that the training contemplated here may not alleviate the scarcity of available employees engaged in purely mapping operations, such as draftsmen, field instrumentmen, and stereoscopic instrument operators, for whom private mapping companies have so great a need. To be sure, college graduates spend a considerable amount of time in each of these phases of operation, but the number of individuals does not fill the demand and these graduates soon advance to supervisory or management positions. No provision exists to my knowledge in any domestic educational system where the school caters to training of this nature.

One approach to this entire problem, and one that might well be initiated by ACSM, is to make a study of the comparative salaries of construction engineers versus photogrammetric and/or cartographic engineers. Another matter ACSM might consider, and which would possibly enable it to "lift itself by its own boot straps," would be to establish professional qualifications for members and then to establish grades of membership, somewhat like the system conducted by the American Society of Civil Engineers. This proposal, however, would have to be considered very carefully as there are many factors involved. Many of you will recall that a similar proposition was considered and rejected a few years ago by the American Society of Photogrammetry.

SURVEYING AS A RECOGNIZED PROFESSION

It is my belief that many engineers engaged in surveying and/or mapping for a living belong to no professional association devoted to their mutual benefit. The American Congress on Surveying and Mapping is prepared to accept them as members, and offers them the fruits of its experience through its journal, its meetings, and through personal contacts with its members. These engineers may be associated with the highway groups of every State, county, and city government. Many may be engaged in private property surveys centered in the vicinity of every county courthouse of the Nation. It has already been demonstrated by our colleagues in many European countries that surveying and mapping occupies a serious and responsible role in society comparable to the usually recognized professions, requiring academic training and impeccable character. I do not need to remind this gathering that surveying and mapping is one of the oldest of the arts and sciences, going back to Babylonian times, and that the title of surveyor has been held in high esteem by many people in different times and places. In some countries the responsibilities of the surveyor are far greater than in this country.

I was greatly interested in the definition of a surveyor as presented at the Eighth International Federation of Surveyors held in Paris last summer. It as as follows:

> The surveyor is a professional man who identifies, determines the boundaries of, measures, and values public or private landed property, whether urban or rural, and whether on

the surface or below; and who is responsible for works done upon it, arranges for the registration of the property, and settles question of ownership connected therewith.

The surveyor also studies, plans, and is responsible for land development and town and country planning.

He deals with the technical, legal, economic, agricultural, and social aspects of the aforementioned.

Our concept of the engineer-surveyor not only embraces the foregoing but also includes cartography (in its broad sense) with a knowledge of geodesy, photogrammetry, and the allied sciences. To meet this objective is admittedly a big job and one that must be handled by our educational system.

TRAINING IN CADASTRAL SURVEYING

I have seen no curriculum of any academic institution that gives consideration to cadastral surveying. More than 40 percent of the membership of ACSM is made up of property surveyors. A review of its journals will disclose many articles dealing with the subdivision of land, city lots, and involved problems of title. Some means must be provided to include training in the field of cadastral surveying, dealing with the various technical, legal, and economic aspects of land ownership.

We must recognize that, while there now seems to be only a limited demand for surveyors and mappers, there is a large, undeveloped potential market for trained professional people in this field. Despite all the efforts of recent years, there still exists a serious lack of adequate maps and surveys in many parts of the world, including, of course, the United States. As you all know, our country embarked a few years ago on a program to assist technically undeveloped countries in overcoming their handicaps. These countries are planning many projects which require reasonably reliable surveys and maps. Undoubtedly, some of these are being prepared by engineers or others who may have only rudimentry knowledge of surveying and mapping procedures. It is my feeling that there is now a greater awareness of the need in this major field of surveying and mapping, and that there are great possibilities in any effort which may eventually develop trained men for adequately mapping the earth's surface. If more institutions become interested in this field, they may find ways of using new techniques, such as digital computers, and so on, for the reduction of surveying data quickly and inexpensively.

We should recognize, naturally, that educational institutions normally respond to the demands of students for various types of courses and hence should not be expected to subsidize work in a field that does not have a large student demand. It appears, therefore, that it would be the duty of the members of ACSM to stimulate higher professional standards and thus create a greater student demand for better professional training. Admittedly only a few schools might be willing to pioneer specialized work in this field without some additional assistance such as grants-in-aid from some foundation and it would not be amiss for the American Congress on Surveying and Mapping to help in the advancement of this objective.

All profesional surveyors and mappers have a primary interest in furthering the exploration and exploitation of our natural resources; this cannot be done without adequate surveys and maps.

Discussion

(The discussion that followed Mr. Wright's paper, with Prof. Lawrence Perez, of Pennsylvania State College acting as moderator, included prepared statements by Prof. Sumner B. Irish, of Princeton University, and Prof. Frederick J. Doyle, of Ohio State University, and informal comments from the floor by various members. Excerpts from the lively and interesting discussion are given below.—EDITOR)

PROF. PEREZ: Gentlemen, I believe most of you who are interested in education realize that this particular problem is an old educational nut that has from time to time withstood the pressures from professional groups and from industrial interests to narrow the curricula as

offered by the colleges in this country.

In fact, I think we can go back to the early period of Napoleon when the National Institutes were the common things in France. At that time he made a survey of one particular Institute, and we find in his writings this particular quote: "The State goes to much expense to train these young men, and when their studies are finished, with the exception of military training, they are of little use to the State. . . . Everywhere I find foremen distinguished in their art, with great skill in execution, but almost none who are able to make a drawing, the simplest calculation on a machine, or express his ideas in a sketch or in writing. There is a defect in our industry. I intend to fill it here."

That was said in 1803. So you can see that even in those days, they had a little trouble as to what should be given in the curricula in the Institutes. . . .

An institution of higher learning has three basic functions, namely: education (to which we will confine this discussion), research, and service. The first function is to educate by developing the capacity for understanding and cooperation through broad study in the basic fields of knowledge: competence in communication; the ability to make valid discriminating judgments based on sound reasoning; and abiding, intelligent commitment to the American democratic way of life; an interest in and understanding of the problems of world cooperation; the ability to make rewarding use of leisure time; an understanding of the ethical, moral, and spiritual principles upon which a satisfactory philosophy of life may be based; and interest and initiative in creative intellectual activity. . . .

The next statement I would like to make is in regard to the position of the educator. Dean Kimball of Yale once said that the present tendency is for men to specialize in undergraduate work, which is a limited educational experience. The various demands of living and working as an engineer are better met by a person who gets a general basic education and who then develops a special interest. . . .

PROF. IRISH: . . . Princeton University stresses the liberal arts background in the environment of its engineering school. We feel this is very important. We say that in the present day we definitely need the liberal arts, the humanities, as a background for the actions of our men.

I would like to quote from a statement that Dr. Peter Vicrick made at the Ninth National Conference of Higher Education. Dr. Vierick is an Associate Professor of History at Mount Holyoke College and a former Pulitzer prize-winning poet. In this case he is speaking of curricula:

> These curricula reflect an atomic age which puts a new premium on the technician and on practical applications of inner theory. Yet without the understanding of man's inner nature which art and literature give us, and without the inner ethical restraint which religion gives us, our outer mechanical progress is paving our road to hell with good intentions.

Dr. Vierick was referring to all curricula, and I think we see that it applies more specifically to our own in the engineering field, so consequently we have to strive today to get this background within which our men can act and make sound judgments in their later years. Accordingly, I would strongly urge that we stay away from a specialized surveying and mapping curriculum, as perhaps would seem desirable in a very narrow sense. . . .

Our engineering program, I think, is becoming more and more basic. Perhaps some in this audience are familiar with the preliminary report of the Committee on the Evaluation of Engineering Education, in which they are breaking down the curriculum into two phases: professional general and professional scientific.

The requirements of this professional scientific phase provide one reason why we try to train our men to become better grounded in the sciences that they might have to use later on. . . . We do not train our men to go out and handle tasks that they might encounter today; we want to give them the background to go out and handle their problems twenty years from now. . . .

One thing that Mr. Wright brought out that I would like to agree with wholeheartedly is the role of the technician in the surveying and mapping field. We have a great deal of work which we can do, I think, in developing and training those people in technical institutes for our surveyors and mappers. . . .

Speaking as a professor from a smaller school, in the liberal arts tradition, I would like to close my remarks by making two recommendations regarding what might be done to improve the educational picture, as far as the surveying and mapping profession is concerned.

The first recommendation is to develop research work in the colleges and universities. One of the big problems now involved in attracting men to our graduate program is that the upper classmen in our schools do not see

what there is to be gained from such a program. . . . Frankly, I believe the development of research is the biggest single factor which would promote the growth of the surveying and mapping curricula. . . . The second recommendation which I would like to make concerns the establishment of an agency for publicity on the need for men in the surveying and mapping field. We have a selling job to do to convince the public of the need for men in such work.

The role of the educator would be much simpler if he could point to specific openings in the surveying and mapping field into which his student might fit. Admittedly, this is a somewhat difficult task because of the small number of large and significant firms in the field.

However, some attempt should be made to make this information available. Undoubtedly the largest single employer of surveying and mapping personnel is the Federal Government. If they would carry on a good, sound recruiting program, I am sure that the fruits would appear fairly soon, and they would be manifold. However, this publicity and recruiting campaign must be handled skillfully. . . .

These two recommendations which I have made toward improving the surveying and mapping education program in this country really boil down to this: we must sell surveying and mapping. . . .

PROF. DOYLE: There is a very marked trend in engineering education away from specialization. Prof. Irish has mentioned to you the preliminary report of the Committee on the Evaluation of Engineering Education. I would like to make reference again to that report and briefly mention the items which they consider as important in an engineering education.

First of all, they say the retention of the basic sciences of mathematics, physics, and chemistry is fundamental; secondly, there should be an intensification of general engineering sciences; thirdly, they recognized the importance of the social and humanistic studies; and fourthly, they recommend the bifurcation of engineering education into professional scientific and professional general.

No responsible engineering educator would try to gainsay the wisdom of this report of the committee. It is obvious to all of us that any modern engineering education must train the individuals coming through it not only in a specialty field of engineering, but also as complete individuals, able and ready and willing to take their places in the modern community.

The trend toward handling the civil engineer specialty requirements has been to put them into fourth- and fifth-year specialized subjects within various fields. Whether this is the proper place for surveying and mapping is the thing to be decided; but we certainly feel that there is a need for attention in this particular field.

The question arises then: Where should the surveying and mapping come? Should it be in the undergraduate curricula or should it be, as Prof. Irish has recommended, solely a graduate or specialty field to be taken after the regular Bachelor of Science degree in engineering?

My answer is it should be treated in both of these sections. No one expects a complete mastery of a specialized field from a B.S. degree. . . . We do not feel that anyone graduating with a B.S. degree is a complete master of the field; and for this reason we have an extensive graduate program, and we do not expect that our graduates with the B.S. degree are finished surveyors and mappers. They have the same right to expect further graduate learning as anyone else in any of the other fields of engineering education.

Mr. Wright has said that there is not a large demand for such students. Admittedly we do not have the same demand that there is for structural engineers, but the American Society of Photogrammetry, The American Congress on Surveying and Mapping, and the American Geophysical Union together comprise some 10,000 members.

To maintain merely this membership would require from 3,000 to 4,000 graduates in surveying and mapping each year. Surveying and mapping education is definitely in a transitional phase. Professional societies should certainly aline themselves solidly behind anything which would increase their professional recognition.

If we feel, and I do, that we are a full-fledged profession and not just civil engineers who could not make the grade, we should do all in our power to have our field properly represented in the university and college curricula.

I feel this would be a laudable objective for the American Congress on Surveying and Mapping.

PROF. W. H. HEISKANEN (Director, Finnish Geodetic Institute, on leave of absence; currently at Ohio State University): There is today, not only in America, but elsewhere in the world, a great need for greater emphasis in our colleges and universities on courses in surveying and mapping. The question concerning academic teaching of these subjects to American surveyors is a most important problem. . . .

I think that surveying engineering must be brought up into the same academic, social, and economic level as the other types of engineering are already. The teaching of surveying must be equal to the teaching of other engineering specialties. . . .

In almost every country they have realized that surveying and mapping should be a separate engineering course, not merely a part of civil engineering and that two types of engineering is too much to study. Therefore, it has turned out that country after country has established special departments for surveying in their colleges and universities.

A special department for surveyors was established in Finland in 1879 and, of course, the program is now much larger than it was then.

It was mentioned that surveyors might not have any future. That I do not understand. Obviously in so big and rich a country as America, I think they ought to have a future. . . . About thirty-one years ago we had a similar problem in Finland when they tried to enlarge the program of the surveyors, and it was thought that the surveyor, particularly the geologist, would have no future. Now we see it is quite different, and surveying engineers have the same salaries as any other engineers in Finland.

PROF. SPRY (Cornell University): At Cornell we are very much agreed with the idea that there is a definite need for getting more surveying instruction, getting better instruction, and getting better men in the work. The question then comes up: Is it best to have a separate degree in surveying and mapping? In this our surveying department did not agree.

There are several points I would like to bring out. Freshmen are able to select a special area they wish to pursue at the time they enter college, but there would not be too much of a demand among them for this specialized training in surveying and mapping.

They would rather go into some more general field which they would feel has a better outlook for their work. . . . There might not be so much demand for a course which would not be quite as secure as a more general training. It has been mentioned previously, and again today, that a college or university training should provide students with education in general living as well as preparation for an occupation, and this is somewhat done away with by a high degree of specialization.

One last point, Cornell is an endowed college and we do not have a lot of money, therefore many classes, such as surveying and mapping, that would not fit economically, are not taught.

PROF. RICE (Rutgers University): In connection with the creation of the Land Surveyor's Division of the New Jersey Society of Professional Engineers, I have recently directed an analysis of our licensees in New Jersey and find we have now licensed over 8,000 men, of which a net of 6,055 are in force. Out of that 6,055 there are 1,207 licensed as professional engineers or in some branch of professional engineering, and land surveying also. In addition thereto there are 340 licensed separately in land surveying only.

There are therefore a total of 1,547 men in New Jersey qualified to practice land surveying in this little State that has 3.1 percent of the population.

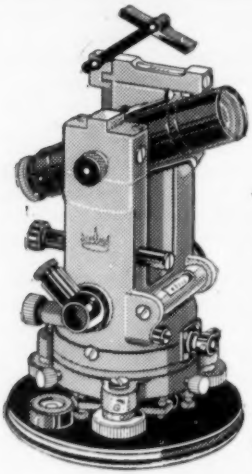
I thought the men in this group might be interested in those figures because it shows a large potential for training in surveying and mapping.

PROF PEREZ: In closing this discussion, I am sorry that we couldn't have remarks from someone interested in using our graduates. I don't know if the problem is closer to a solution, but I hope that the discussion this afternoon will motivate some clear thinking on this very real problem.

* * *

An Australian speaker is quoted in the *New Zealand Surveyor,* Feb. 1954, as follows: "We should consider the wide scope of the profession and be sure that our outlook is broad and not confined to our cadastral surveys. We must oppose the tendency to relegate the surveyor to the position of a technician operating as an inferior in his own field. We must insist that the surveyor is competent and qualified not only to carry out his technical duties but also to control and administer organizations based on survey."

ASKANIA



MIDGET OPTICAL READING

TRANSIT TK

with erecting eyepiece and optical plummet

Reading 1′
Estimation 6″
Instrument weight 4 lbs.

★

LOW COST

HANDY
EASY
EFFICIENT
HIGHEST
PRECISION

ASKANIA

DUMPY LEVEL

with coincidence level reading

HANDY
EASY
EFFICIENT
PRECISE
LOW COST

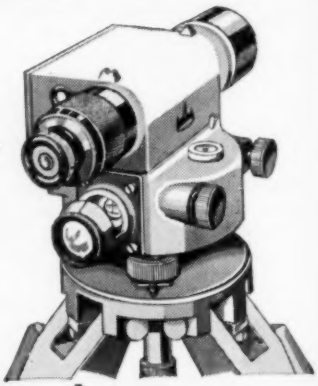
Magnification 25X

•

with or without Horizontal Circle

•

Reading Estimate 1′



BERLIN **ASKANIA-WERKE AG** FRIEDENAU

REPRESENTATIVE

170 Broadway **GEO-OPTIC CO. INC.** New York 33, N. Y.

An Improved Curriculum for Cartographic Training at the College and University Level

By GEORGE F. JENKS

UNIVERSITY OF KANSAS

WORLD War II and unsettled postwar conditions have wrought revolutionary changes in mapping activities. An increasing number and variety of maps are now being produced for service men and civilians. New uses for existing maps are being found and rapid technological advances necessitate the development of new and unique types of maps.

The demand for more and greater variety in maps has brought about an expansion of established map-making facilities and the creation of new agencies, both private and government. This expanding activity has posed several problems: (1) mass production techniques had to be improved; (2) new inks, papers, and other materials were needed; and (3) additional personnel had to be trained. In typical American fashion the new techniques, material, and the expanded facilities to house them were solved with relative ease, but perhaps also typically American has been our lag in changing cartographic training to meet the needs of the present day.

Increased demands for map-makers have induced many American colleges and universities to add cartography courses to their curricula. Prior to World War II very few courses in cartography were offered in the United States, but now well over one hundred institutions of higher learning offer training in the subject. Unfortunately, increasing the number of courses does not solve the problem of poorly trained map-makers. That cartographic instructors are cognizant of the need for improved training in map-making is evidenced by numerous articles in recent issues of professional journals and by the repeated attention this problem receives at national meetings. For example, the last two roundtable discussions of the cartographic section at the meetings of the Association of American Geographers were devoted to the problem of cartographic training. The training problem is so complex and involved, however, that these rather brief treatments serve mainly to point out new deficiencies and to air old complaints.

This report results from a study of cartographic training made by the author during the twelve-month period ending September 1, 1952. A fellowship[1] made possible full-time research into the problem and liberal travel allowances gave opportunity to visit many of the leading cartographers in the United States.

OBJECTIVE AND SCOPE OF THE STUDY

The objective of this report is the presentation of a cartographic training curriculum at the college level, which meets the needs of present day map-making. The research on which this paper is based was directed toward finding answers to the following questions:

1. What are the major deficiencies in present day cartographic training?
2. What should be the objectives of cartographic training?
3. Where does cartography best fit into the college curriculum?

Reprinted from *Annals of the Association of* American Geographers, Vol. XLIII, December 1953, No. 4, pages 317–331.

[1] This study was undertaken by the author during his tenure of a fellowship granted by the Fund for the Advancement of Education to enable him to broaden his qualifications for college teaching. It represents the independent work of the author, and he is solely responsible for it.

4. What subject matter should be included in a program of cartographic training?

Answers to these questions were sought from employers of cartographers, practicing cartographers, and teachers of cartography. More than two hundred informants were consulted in twenty governmental map agencies, nine commercial or quasi-commercial map companies, and ten universities. Slightly more than one-half of these calls resulted in interviews complete enough to be used in the report. In addition, the cartographic work carried on by these organizations was studied with special interest centered on the training needed to prepare functioning cartographers.

WHAT ARE THE MAJOR DEFICIENCIES IN PRESENT DAY CARTOGRAPHIC TRAINING?

It is almost impossible to discuss cartographic training with any practicing cartographer or employer of cartographers without being overwhelmed by a spontaneous outburst of complaints. All types of inadequacies are pointed out, ranging from complete rejection of the present curricula down to changing only details. Before analyzing these complaints, however, it seems wise to look back into recent cartographic history and examine some of the reasons for the high degree of dissatisfaction with the products of contemporary cartographic training.

Cartography has only recently been recognized as a field of specialization in the United States and therefore there is a limited background of teaching practice. Prior to World War II very few educational institutions offered any training in the field, and what was offered was very limited in scope. Practicing cartographers frequently drifted into map-making from other occupations, usually with little or no formal training and often with limited experience. Practically the only thread of unity in cartography was an understanding of the utility of maps.

That the amorphous nature of the past carried over to contemporary cartography can be seen by comparing accepted definitions of the field. "Cartography is considered as the science of preparing all types of maps and charts, and includes every operation from original surveys to final printing of copies."[2] And—cartography is "the production of maps, including construction of projections, design, compilation, drafting, and reproduction."[3] The first definition considers any type of work, however remotely connected with map-making, as cartography—thus geologists, hydrographers, geodesists, surveyors, photogrammetrists, printers, etc., are all cartographers. The second definition, on the other hand, recognizes the need for a variety of specialists in mapping and limits the cartographer to those phases which take place after the basic information is collected.

It is clear that the first definition requires a superman in training and abilities. Certainly most cartographers accept the second as being closer to their own. The word cartography as used in this report refers to that area of map-making which starts with the evaluation of source materials and follows along with map design, compilation, drafting, and finally ends with some supervision of map reproduction.

Several other factors have served to limit the effectiveness of cartographic training. With the increase of cartography courses, many inexperienced instructors were pressed into service. Too often, cartographic laboratories are poorly equipped and map libraries totally inadequate. In addition, research in the field of cartography has been limited, and a large part of the research which has been done is not available to the instructors.[4] Perhaps even more important than these has been the fact that academic cartography has suffered from too great an emphasis on theory; too little time and effort has been spent on the practical application of theory. Theorizing on art does not make an artist, knowledge of medical

[2] *Modern Cartography,* United Nations, Department of Social Affairs, Lake Success, New York, 1949, p. 51.

[3] *The American College Dictionary,* Harper & Brothers Publishers, 1948, p. 185.

[4] Governmental mapping agencies have been leaders in cartographic research, but, because many of them are intelligence agencies, their research results are often classified.

theory does not make a qualified doctor, and talking about maps (and listening to lectures on cartography) does not mean that the student can execute a map.

Not all of the blame for present and past deficiencies in cartography can be laid in the lap of the academicians. Too many employers of cartographers have reacted to the academic stress on theory by overrating experience. Experience is invaluable, especially in mapping technology, but in practice it is almost always limited to one type of map problem and the production techniques involved. Frequently, those who decry academic training expect "green" college graduates to possess the maturity of judgment and graphic skill that can be gained only with years of experience.

Poor cartographic training has resulted in poor maps, but the average American, unable to discriminate between good and bad maps, has brought no pressure to bear on producers of poor maps.[5] Thus there has been little incentive for employing cartographers trained in theory since little or no competitive advantage has resulted from improved map quality.

In addition to these general observations on the inadequacies of cartographic training, many complaints of a very specific nature were encountered. These are primarily concerned with subject matter content of the field of cartography and are treated in another section of this report.

WHAT SHOULD BE THE OBJECTIVES OF CARTOGRAPHIC TRAINING?

The increasing demand for cartographic training on our college and university campuses comes from highly diverse interests. Some students wish to become professional cartographers, others want to make and use maps as tools for a better understanding of their own disciplines, while others are interested only in intelligent map-use and are not concerned with map-making. In addition, there are those who procure, evaluate, and file maps for the use of others.

Objectives which seem to meet these highly diverse demands for cartographic training are:

1. *Cartographic training should stress the fundamental principles of the field as a whole.* One of the primary objectives of university training is to develop in the student a basic understanding of his discipline so that he may go on from there to the limits of his capabilities. This is especially desirable in cartography since there is need for so many talents and skills in the profession that they cannot all be covered in a training program. Attempts to train for specific jobs are futile indeed.

One of the major criticisms of past and present cartographic training, and justifiably so, has been the limited scope of cartography courses. Few sponsoring departments have taught cartography in such a manner that it is related to and integrated with other fields. Instead they have limited training to those phases of cartography which are most useful in their special area of interest. For example, geographers have stressed small-scale maps and frequently ignored large-scale topographic maps, and engineering departments have placed their stress in a reverse ratio. If cartography courses are to serve their function, this narrow approach to the subject should be done away with and training should be given in all phases of the subject.

2. *Cartographic training must include numerous opportunities for applying theory to actual map problems.* Cartographers should receive a substantial part of their training in the laboratory. Time and again during my recent visits I have heard the compaint, "Academically trained cartographers may know theory, but only exceptional graduates can put the theory to work." This is not a plea to turn completely to techniques and technology, but it is a suggestion that bears serious thought. Certainly no university program in cartography can turn out students accomplished in the manipulation of all of the materials and instruments which a cartographer needs, but the university trained cartographer should know of their existence and be familiar with their operation and utility.

[5] "Anybody can publish any kind of a map, however bad, and get away with it. Ordinarily a field is subject to the law of natural selection —the things that are bad or inadequate fail to survive. But in cartography this law does not operate effectively because the ability to discriminate among maps is not widespread in this country."—Richard Edes Harrison, "Cartography in Art and Advertising," *The Professional Geographer*, II, No. 6 (November 1950): 12.

Ability to perform is as necessary to cartography as it is to any other field. Who ever heard of an artist who couldn't paint or draw, a musician who couldn't play or compose? In the same way, every cartographer should be able to plan, compile, and draft a map.

3. *Cartographic training should encompass a wide range of general and technical courses in allied fields.* Good maps result from the wedding of the fine graphic rendition and thorough understanding of the subject matter represented since the cartographer, unlike the photographer, must use selective judgment in planning and compilation. Of equal importance to the cartographer is knowledge of the methods and techniques used in the disciplines of surveying, photogrammetry, geodesy, photography, printing, etc.

Table 1 is a compilation of answers to the question "What background or allied courses do you feel are desirable for cartographic trainees?" The great range of recommended subject matter emphasizes the wide scope of cartography and the many variations which can be found in the field. Obviously, no single individual can encompass all of these allied fields, but the more of them a cartographer is familiar with the better qualified he will be.

4. *Cartographic training should be available to students in many disciplines and in varying degrees of intensity.* This objective recognizes the need for flexibility in training since maps serve various individuals and disciplines in different ways and in varying degrees of utility. The objectives of some students may be increased intelligence in map use and appreciation of the efficacy of maps. Others may wish training which will enable them to produce simple maps to accompany professional papers in their field, while still other may see cartography as their future life's work. By organizing courses properly a program of cartographic training can be "tailor-made" to suit the needs of the individual.

TABLE 1.—*Courses in Allied Fields Recommended for Cartographic Training by Personnel in Government, Commercial, and Quasi-Commercial Mapping Organizations*

Allied Field	*Federal Government Mapping Agencies*	*Commercial or Quasi-Commercial Map Companies*	*Total*
Lithography & Printing	17	4	21
Photogrammetry	16		16
Air Photo Interpretation	13		13
Surveying	13		13
Geographic Field Methods	10	1	11
Regional Geography	7	1	8
Landforms	7	1	8
Mathematics	7		7
Physical Geography	5	1	6
Political Geography	5	1	6
Art	1	3	4
Geology	4		4
Foreign Language	3	1	4
Hydrography	3		3
Statistics	2	1	3
Physics	2		2
Scientific Writing	2		2
Soils	2		2
Climate	1		1
Library Science	1		1
History		1	1
Political Science		1	1
Advertising		1	1

Recognition is also made here of the usefulness of combination such as cartography and medicine, cartography and economics, etc. Many small map-making and map-using organizations are greatly interested in dual majors.

WHERE DOES CARTOGRAPHY BEST FIT INTO THE COLLEGE CURRICULUM?

The scope of theoretical cartography and its associated technology is broad enough to justify the organization of independent departments, as least in the minds of some cartographers. Prof. George H. Harding, in discussing the lack of complete and formal education in the profession, comes to the conclusion, "So apparently the modern cartographer, having come of age, so to speak, must leave the 'old homestead' of civil engineering and establish his own home if he is to achieve his destiny.[6] Prof. Wilbur Zelinsky suggested a school of cartography at the Cartographic Panel during the national meetings of the Association of American Geographers at Worcester, Mass., on April 6, 1950.[7] Other practicing cartographers, concerned with the present inadequate training, have also made similar recommendations to me personally during the past year.

From a practical standpoint, however, few universities could justify the heavy expense necessary to acquire the additional staff for such departments, even if personnel were available.[8] The demand for professional cartographers is relatively small when compared with other disciplines and probably will not become much greater in the future. For example, one of the major professional organizations of cartographers, the American Congress on Surveying and Mapping, has less than four thousand members. Thus the demands from a profession of this size could be satisfied by cartography departments in a few schools.

Separate departments of cartography, even if established at only a few schools, could do much to improve the quality of training for professional cartography, but one of the major objectives of cartographic training would not be met by such an arrangement. Instructors in cartography must accept their obligation to students in other disciplines. Cartography has become, and will continue to become, an increasingly useful and necessary tool for specialists in many other fields. Most cartographic training in the past has resulted not from the demand for professional cartographers, but from the awareness of the need for cartography by such disciplines as geography, engineering, geology, forestry, architecture, economics, sociology, and others. This is a need which occurs on every university campus and one which would not benefit from the organization of a few "super" departments of cartography on isolated campuses. The need for this type of training by large numbers of students is so important from the educational point of view that it cannot be ignored.

If we accept the three propositions: (1) cartographic training is almost universally inadequate at the present time, (2) separate cartography departments could improve professional training, but are impractical for most universities, (3) cartography is needed on all campuses by students in many disciplines, we find ourselves in the same dilemma which has been with us for some time. How, then, can adequate cartographic training for both professional cartographers and students in other disciplines be achieved on the average university campus? The solution to this problem is not out of reach on most campuses if the following adjustments can be made:

1. Broaden the scope and content of present cartography courses to provide more complete subject matter coverage.

[6] GEORGE H. HARDING, "A Possible Solution to the Problems of Surveying and Mapping Education," SURVEYING AND MAPPING, XI, No. 2 (April-June 1951): 105.

[7] Discussion (following the Cartographic Panel of the Worcester meetings of the Association of American Geographers), *The Professional Geographer*, II, No. 6 (November 1950): 23.

[8] Richard Edes Harrison said, in answering Zelinsky at Worcester, that while a separate school of cartography was a sound suggestion "Probably nothing could be done about it in the near future because of the difficulty of financing it and of filling out a faculty."

2. Accept the obligation to train students from all disciplines. In most cases this can be done by minor course changes and changing prerequisites to open courses to students from allied or associated fields.

3. Open courses in allied fields to students wishing to specialize in cartography. (*See* table 1 for a listing of courses in allied fields considered to be desirable training for cartographers.)

4. In some cases a degree in cartography could be given by setting up an inter-departmental committee to supervise the curriculum of those students wishing to specialize. These steps would adapt present course offerings in cartography and associated fields to the needs of the student body. Obviously, such a program lacks the integration and supervision of a separate department, but it accomplishes much toward improving and broadening training in cartography. It has the added advantage of being practical from the economic point of view since it fits into the framework of established departments and can be adjusted to suit the individual circumstances found in each school.

WHAT SUBJECT MATTER SHOULD BE INCLUDED IN A PROGRAM OF CARTOGRAPHIC TRAINING?

The objective of this study has been to determine and define the subject matter content of a cartographic training curriculum at the college level. Four aspects essential to such a cartographic training program are: (1) an understanding of cartographic concepts, (2) the development of cartographic skills, (3) a knowledge of map-making instruments and their use, and (4) familiarity with graphic materials and processes. Any program of cartographic training must recognize the necessity for training in all four of these aspects.

A new body of fundamental data pertaining to subject matter content of cartography was obtained from interviews with eighty-eight practicing cartographers and employers of cartographers. A tabulation of these opinions is found in table 2. Each informant was asked to answer the question, "What subject matter should be included in a college cartographic training program?" The practicing cartographers and employers of cartographers interviewed were employed in twenty governmental and nine commercial mapping organizations. About equal numbers of supervisory and non-supervisory personnel were consulted.

A breakdown of the academic and experience backgrounds of the informants shows diversity. Those with academic training in cartography came from a great many disciplines such as geography, engineering, geology, forestry, etc., and have as their common denominator one to several courses in cartography. Some have had as many as thirty years practical experience in the field while others have had less than one year of experience. Thus the sample cuts across contemporary cartography as it is practiced by our leading map-producing agencies.

In evaluating table 2 it must be remembered that the subject matter content listed here results from replies to the question "What subject matter should be included in a college cartographic training program?" No check list or questionnaire was used to obtain the information since it was felt that spontaneous answers to the question were much more valuable than answers stimulated by a long list of subjects which tend to influence the informant. This accounts for the relatively low percentage of answers for any one category, since the natural tendency was for the informant to present those aspects of cartographic training which were of immediate interest and concern. Thus the value of table 2 is strengthened since it not only presents the relative importance of any single phase of cartography but the diversity of subject matter listed gives a good measure of the breadth of scope considered to be essential by practicing cartographers.

The validity of table 2 can be questioned to a degree in that it may reflect "hindsight" on the part of the informant. There is a tendency for the successful practitioner of a profession to believe that his training was ideal. As a result, there may be an overemphasis in some categories since a very large proportion of the individuals contacted had at least some engineering training in their background. There is also the tendency on the part of an informant to em-

TABLE 2.—*Subject Matter Content of Cartography Curriculum Recommended by Personnel in Government, Commercial, and Quasi-Commercial Mapping Organizations*

Subject Matter Content	*Federal Government Mapping Agency*	*Commercial or Quasi-Commercial Map Company*	*Total*
Drafting	28	11	39
Materials and instruments for map-making	21	6	27
Photographic processes used in map-making	23	4	27
Compilation methods and techniques	17	9	26
Sources of map-making data	22	3	25
Editing and proofing maps	17	6	23
Map projections	20	3	23
Map scales	19	3	22
Geodetic control	17	1	18
Color separation in map-making	14	3	17
Evaluation of map-making data	15	1	16
Map reading and use	14	1	15
Map planning and design	9	3	12
Place names on maps	9	3	12
Symbolization of maps	10	1	11
Selection of data in map-making	7	2	9
Typography	7	2	9
Research techniques in map-making	6	2	8
Cataloguing and filing maps	6	1	7
Generalization of map-making data	5	2	7
Map grids	7		7
Costs in map-making	4	2	6
Reduction and enlargement in map-making	6		6
Hand lettering	5	1	6
Interpolation and use of tables in map-making	5	1	6
Map specifications and their use	4		4
Bearings and azimuths	3		3
Number of interviews	73	15	88

phasize those aspects of training which were especially deficient in their own, or their employees' background. Unfortunately, the author was unable to ascertain to what degree these tendencies may have affected the results of the interviews as presented in table 2.

The first four items listed in table 2 are highly significant in planning a cartography curriculum. The skills of drafting and compilation are as old as cartography itself but they are still in great demand. Also considered essential is a knowledge of the materials, instruments, and photographic processes used in map-making. All four of these aspects of cartography emphasize the need for laboratory instruction as an essential part of the training.

It is, no doubt, equally as significant that such phases of cartographic training as map planning and design, selection of map-making data, research techniques in map-making, and the generalization of map-making data are so far down the list. The author was keenly aware of their importance in the cartographic work being carried on in the organizations visited. Perhaps this is a bright spot in our present training, but it

may well be that other, and to my mind less important phases of cartography, are lacking to a greater degree. Many teachers of cartography would agree that all of these aspects of training listed are essential, but few would wholeheartly agree with their relative importance as shown by table 2.

Table 2 is only one of several guides which were used in compiling the basic checklist of subject matter of cartography which follows. The cartographic training programs of the ten universities visited were studied and many suggestions came from instructors at these schools. The cartographic work being carried on by the various organizations visited was analyzed in light of training needed. Literature on cartography and the teaching of cartography was consulted. In addition, my own experience both as a student and as an instructor of cartography was utilized.

The problem of presenting the subject matter of cartography is difficult of solution. It seems impractical to present a teaching outline since it is firmly believed that the cartography courses given at a given institution should be (yes—must be) tailored to fit the individual needs of that institution and the instructoral personnel. Since this is the case, subject matter is presented here as a basic check list of content in cartography. Attempts have been made to make it as complete as possible but the relative emphasis on each phase of the training and the order of coverage were not considered in its compilation.

Subject Matter Check List of Cartography

- History of maps
  - Emphasis on the development of maps and mapping
    - Increased accuracy
    - Changing techniques
    - More and more of earth's surface being mapped
    - Increasing variety of maps
  - Much yet to be done in mapping earth's surface
    - Little known about wide areas of earth's surface
    - Increasing knowledge and technology increases need for more and new types of maps
- The Earth
  - Shape
  - Size and dimensions
  - Movements
- Earth grid systems
  - Latitude and longitude
  - Atlas grids
  - Rectangular survey (township-range)
  - State coordinate system
  - Military grids
- Projections
  - Need for systematic arrangement of earth grid on a plane surface
  - Desired characteristics of projections
  - Types of projections
  - Deformation of projections
  - Selection of proper projection
  - Graphic construction of projections
  - Construction of projections from tables
- Measurement of distance, direction, and area
  - Distance
    - Length of 1° latitude
    - Length of 1° longitude
    - Other units of measurement used on maps
    - Methods of distance measurement

- Direction
  - Compass rose
    - True north
    - Magnetic north
    - Azimuths
    - Bearings
    - Loxodromes
  - Great circles
- Area
  - Units of areal measurement
  - Methods of areal measurement

Map scale
- Relationship of maps to earth
- Methods of expressing scale relationship
  - Representative fraction
  - Graphic
  - Verbal
  - Areal
- Determination of unknown map scale
- Transforming scales
- Changing from one map scale to another
  - Methods
  - Effect upon map detail
- Plotting to scale

Map research and evaluation
- Sources of materials used by cartographers
  - Map publishers
    - Area and subject matter coverage
- Sources of aerial photographs
- Sources of statistical and descriptive data
- Prominent libraries specializing in cartographic materials
- Cataloguing and filing maps

Evaluation of map source materials
- Accuracy
- Technical rendition
- Aesthetic rendition
- Does it do the job indended?
- Date
- Publisher and reputation
- Marginal information (source of data, how compiled, classification of features, projection)

Map reading and map interpretation
- Types of maps and map problems
  - Stress familiarization of student with as great variety as possible
  - Practice interpreting cultural and physical features on maps

Aerial photographs
- Use of aerial photographs in cartography
  - General introduction to photogrammetric technique (What type of material do cartographers get from photogrammetrists?)
  - Use of photo index, photo mosaic
  - Radial line plot
  - Photo interpretation
  - Use of stereoscope

Map planning
- Visualizing a map to suit the need
- Search for source materials
- Evaluation of source materials (reliability and suitability)

- Economics
  - Methods of reproduction
  - Time estimate
  - Cost estimate
- Planning around the above limitations
  - Choice of scale
  - Selection of projection
  - Selection of detail to suit purpose and scale
  - Number of colors

Map design
- Fundamentals of map design
- Design to fit purpose and desired emphasis
- Effect of reproduction processes on design
- Visualization of finished map-layout
  - Overall patterns
  - Patterns in detail
  - Selection of style and size of type
  - Selection of line weights
  - Contrast and emphasis

Symbolization
- Need for symbols
- Fundamentals of good symbolization
- Qualitative and quantitative symbols
- Point, line, and area symbols
- Selection of symbols to suit purpose of map
  - Suitability of symbol design
  - Relationship of single symbols to map as a whole
    (Harmony, visibility, part of overall pattern of the map)

Control
- Need for horizontal and vertical control
- Source of control data
- Plotting control on graticule
- Datums—converting data from one to another
- Cadastral survey data of use to cartographer

Compilation
- Common compilation procedures
- Need for geographic background and understanding of:
  - Map subject matter
  - Selection of detail to give honest representation of the area
  - Intelligent generalization of detail
- Relation of compilation to map-making processes which follow (especially reproduction)
- Materials and instruments used in compilation
- Changing data to uniform units
  - Scale conversion (pull-ups and diapositive mosaics, pantograph, photostat, reflecting projector, square-method)
  - Use of tables in converting measurements to the standard
- Compilation drafting

Type matter on maps
- Geographic names (Board on Geographic Names and its work)
  - Transliteration
  - Glossaries
- Methods of applying type matter to maps
  - Free hand lettering
  - Mechanical lettering devices
  - Stick-up lettering
  - Placement of geographic names and type matter

- Type styles and sizes used on maps
- Ordering stick-up
- Reaction of type matter to reproduction processes

Methods of map reproduction
- Offset lithography
- Letter press
- Photostat and photographic processes
- Blue print, ozalid, Van Dyke, etc.
- Economics of the various methods

Preparation of map copy for reproduction
- General requirements for all types of reproduction
- Specific requirements for each type of reproduction
- Additional requirements imposed in reproduction by television camera
- Visit reproduction plant

Map editing, proofing, and revision
- Map proofs (black and white, Ansco-color, dye color)
- Editing (accuracy, technical rendition, aesthetic rendition)
  - Check list
  - Overlays

Diagrams, graphs, cartograms, and miscellani
- Essentials of graphs
- Pictorial maps and graphs
- Block diagrams
- Relief maps
- Line, area, volume, and logarithmic curves and their application to cartography

Procedures in map-making organizations
- Typical flow of work
- Relation of each process to those before and after
- Cartographic specialization

* Map-making instruments
- Use and care of:
  - Pens, dividers, scales, and other small instruments
  - Brushes
  - Air brush
  - Chartograph
  - Lettering guides
  - Slide rule
  - Reducing glass
  - Planimeter, map measure
  - Shop microscope
  - Pantograph
  - Reflecting projector
- Photography as a cartographic tool
- Availability and cost of instruments

* Graphic materials
- Drafting surfaces
  - Characteristics and utility in relation to effect
  - Ease of manipulation
  - Stability, transparency, translucence
- Paints, pencils, inks
- Availability and cost of materials

---

* These three aspects of cartographic training can probably be best taught at the university level by introducing the students to them piece-meal as they carry out their laboratory exercises.

* Map drafting
  - Drafting specifications
  - Color separation drafting
  - Drafting for reduction and/or reproduction
  - Drafting on plastics
  - Negative engraving
  - Tricks of the trade

A FUNCTIONAL INTRA-DEPARTMENTAL CARTOGRAPHY TRAINING PROGRAM

The arrangement of the subject matter of cartography within the limitations inherent in an intra-departmental situation with limited teaching personnel is difficult. This is especially so because maximum flexibility to meet the needs of students with highly diverse objectives is essential. The following course arrangement is presented with the full realization that modifications to suit the instructional personnel and objectives of any given institution may be necessary.

Five courses comprise the core of the suggested curriculum:

Course 1.—Elementary training in projections, grids, scales, lettering, symbolization, and simple map drafting.

Course 2.—The use, availability, and evaluation of maps.

Course 3.—Planning, compiling, and constructing small-scale maps, primarily subject matter maps.

Course 4.—Planning, compiling, and constructing large-scale maps, primarily topographic maps.

Course 5.—Non-technical training in the preparation of simple manuscript maps for persons wishing the minimum in the manipulative aspects of cartography.

Courses 1 and 2 would have no prerequisites. Course 5 would have as its only prerequisite 10 hours in the students' own field of specialty. Courses 3 and 4 would have course 1 as a prerequisite. All except possibly course 2 would be laboratory courses with strong emphasis on application of theory to actual map problems. Additional work could be made available to students wishing to specialize in cartography through the means of special reading or special problem courses.

While this program is not set forth as the ideal answer to present day training problems in cartography, it does serve as an example of what can be done in a situation where a separate department of cartography is impractical. It represents an effort to organize the subject matter in accordance with a basic philosophy of cartographic training. Under this concept there are the obligations to provide training, both as sound and as broad as possible for those whose major interest is cartography; to serve the needs of students and staff in the parent department; and to provide opportunity for interested students in other fields to attain some degree of competence in this discipline. This three-fold obligation provides the major challenge for the improvement of cartographic training.

---

* See footnote, preceding page

CONTROLLED SURVEYORS

In an outline of the history of surveying in the Province of Aukland, printed in the February 1954 issue of the *New Zealand Surveyor,* is an interesting requirement governing surveyors engaged in contract surveys for the Crown: The surveyors worked under contract to the Crown under regulations gazetted September 28, 1842, and were granted licenses for that work. When such licensed surveyor was about to undertake a survey, he was required to deposit his license with the Surveyor-General. It was not returned to him if his survey was found incorrect or defective.

Scribing Today[1]

By CHARLES F. FUECHSEL
U. S. GEOLOGICAL SURVEY

THE panel discussions on negative engraving (or scribing) which were held at the Thirteenth Annual Meeting of ACSM, may have appeared overly optimistic to some of the listeners. However, I am happy to be able to report from recent contacts with the several speakers that operations in their respective agencies during the past year have fully justified the favorable predictions, and in many respects performances have actually exceeded expectations. It may accordingly be of interest to summarize the comparative aspects of scribing versus drafting, on which there now appears to be rather general agreement:

1. Substantial savings in operating time, ranging in most Federal agencies from 10 to 40 percent depending on the types of maps or charts in production.
2. Better quality, such as sharper line work in general, and more consistent line weights. This, together with the direct contact process of press plates, maintains better relative values, such as proper contrast of index and intermediate contours.
3. Much shorter training periods—with fewer failures and low-aptitude results.
4. Greater "mechanical-aids" potential—which means that further gains in efficiency and quality, over current levels, are reasonably assured.
5. Reduction in processing steps, conserving both time and quality, with an incidental gain from the fact that there are fewer materials to handle and store.
6. Simplification of revision and correction processes.

On the unfavorable side, it must be admitted that coating processes are not yet entirely foolproof, and that lettering and stickup pattern applications are not, at present, as convenient as they were under drafting. However, these are only temporary discomfitures, which, in all probability will be with us only for a short time. The placement of lettering on a separate overlay presents only a minor inconvenience, while the "spading-in" of patterns, or placement on a separate overlay, involves little additional effort.

In speaking for the Geological Survey last year, I indicated a probable long-range saving of 25 percent in scribing our topographic maps. A recent review of time sheets by our Atlantic Region office shows that for a Kentucky area involving 70 quadrangles (about 4,200 square miles) color-separation drafting averaged 527 hours per quadrangle. For an adjoining area of 34 quadrangles (about 2,000 square miles) which were processed by scribing, the average was 404 hours. These figures, I believe, are fairly representative for the immediate future in this particular office, which has now nearly completed the conversion of their "finish" drafting force to scribing. Our other three region offices are not quite half converted from drafting to scribing at present. We hope to complete the conversion of the Topographic Division drafting forces as a whole this year—for a total of about 300 "finish" scribers. The Geological Survey is moving methodically on this conversion in order to disturb production—which is tightly scheduled—as little as possible, and to avoid loading up on instruments and other facilities for which the ultimate stage of development has not yet been reached.

I would like to show you a training movie which was made by the Geological Survey several months ago. This will furnish some background for those not already familiar with the scribing procedure, and should be helpful in evaluating recent developments, which will be discussed later.

Presented at the Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954.

[1] *See also* "Recent Developments in Negative Scribing," SURVEYING AND MAPPING, Oct.–Dec. 1953.

(A motion picture, "Negative Scribing of Topographic Maps," was shown at this point and it was noted that several changes have already been made in the procedures shown.)

NEW DEVELOPMENTS

The Geological Survey is experimenting with the application of scribing at stereo-compilation and field-survey stages. Some of us believe that very significant savings, as well as better guide copy and simpler process steps, will be realized in planning toward the following procedure as a goal:

1. Make preliminary stereo-run in pencil, on painted plastic, at reproduction scale (universal pantographs have been designed for this purpose for ER-55, Kelsh, and Multiplex units).

2. Compile on two base sheets, contours on one, and all planimetry on the other.

3. Scribe "final" run with all adjustments required for standard symbolizations. (Instead of repenciling or inking as heretofore.)

4. Prepare two-color guides on white- or yellow-coated plastic sheets for field completion, by contact from scribed originals. This will afford much clearer copy than the single-color blueline guides furnished heretofore. Field engineers will plot corrections in pencil and scribe (rather than ink) actual changes to be made to base sheets.

5. Photo-process field copy with scribed adjustments to base compilations by contact.

6. Make corrections, and preserve contour compilation sheet as reproduction copy. This will be feasible if field corrections have not been extensive, which is usually the case. As compilation sheet is "right reading" it cannot be used for contact process of press plate with fully satisfactory line reproduction. Several possible solutions for this problem are being developed.

7. In areas of sparse cultural development

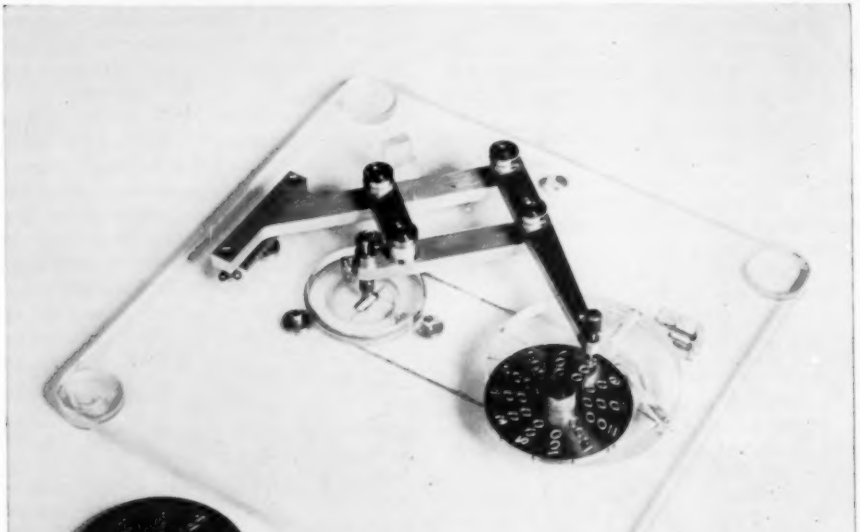


FIGURE 1.—Pantograver for contour and spot elevation figures.

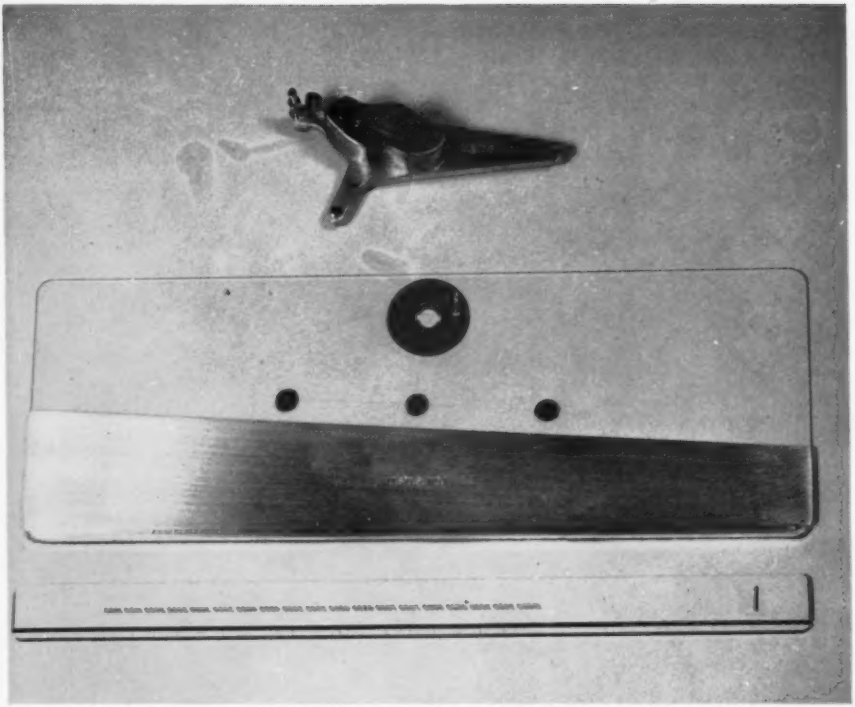


FIGURE 2.—LeRoy figure scriber.

it may also be feasible to "color-separate" planimetry by photo-mechanical means. However, in developed areas, the culture, drainage, woodland, and "red-road" plates will probably be prepared in the regular manner by scribing the several guide copies processed from the planimetric compilation base.

The foregoing process, in addition to saving substantial "finishing" time, offers a more satisfactory working medium for both stereo and field personnel. It provides clearer guide copy for field and "finishing" stages, as well as other incidental gains. Working at the smaller reproduction scales may be troublesome to stereo personnel for a while, but it will assure reduction of excessive detail caused mainly by the large compilation scales heretofore employed on Multiplex and Kelsh productions. It will also enable them to operate on full map sheet units rather than fractions thereof.

In the following discussion of materials and instruments I will endeavor to give you the apparent cross-sections of opinion, as nearly as I have been able to observe them. These are my own interpretations and are not necessarily the considered opinions of the Geological Survey.

BASE MATERIALS

Vinyl sheeting is currently used as the scribing base in most agencies. Fiberglass and various laminates also hold promise of satisfactory applications. CR-39 (developed by Pittsburgh Plate Glass) has a good scribing surface, but is not sufficiently scale stable for maps requiring close color register. A promising recent introduction is Mylar, a polyester sheeting developed and now in production by DuPont. It has strength and no discernible shatter tendency, which

probably indicates better longevity than other suitable materials now available. Thermal stability appears better than that of Vinyl, but humidity response is slightly greater (for type A). With this material it is possible to use very thin sheets (about two or three thousandths) for reverse copying (processing of printing plates from "right-reading" negatives).

We have tried Mylar on stereocompilation and "final" scribing with satisfactory results. DuPont recently advised that type D Mylar is now in production. This has better transparency and surface character-

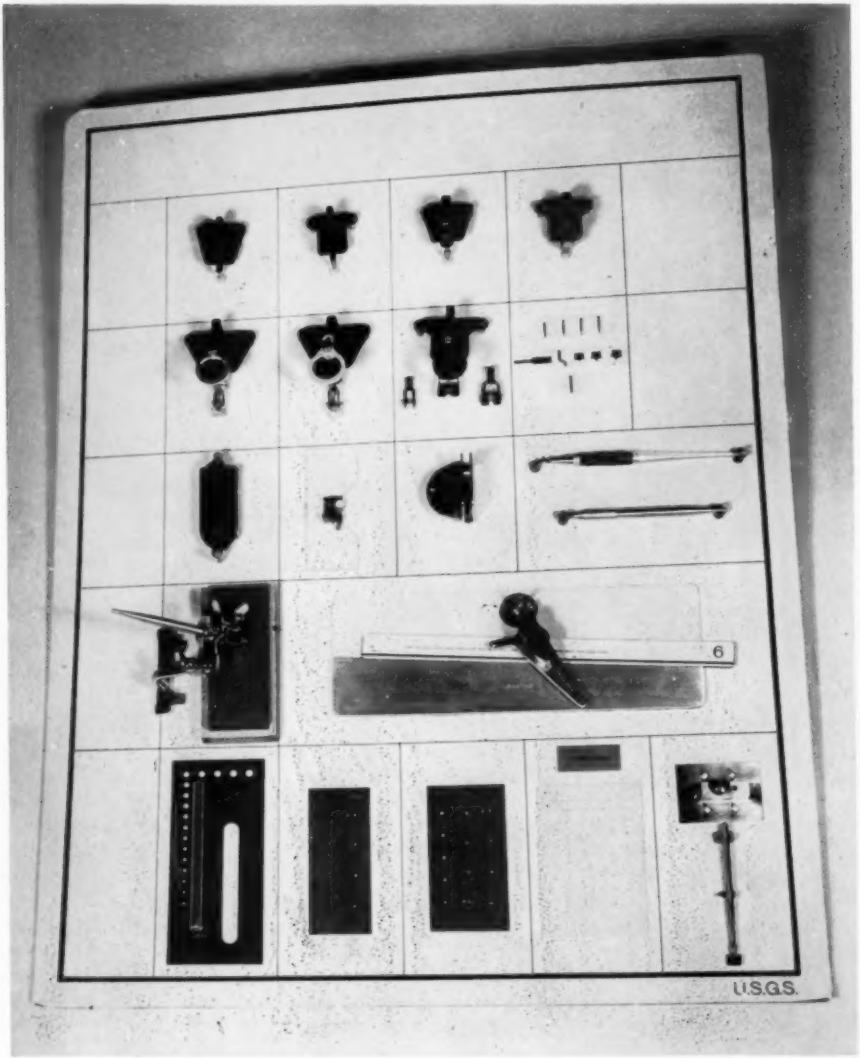


FIGURE 3.—Instrument assembly.

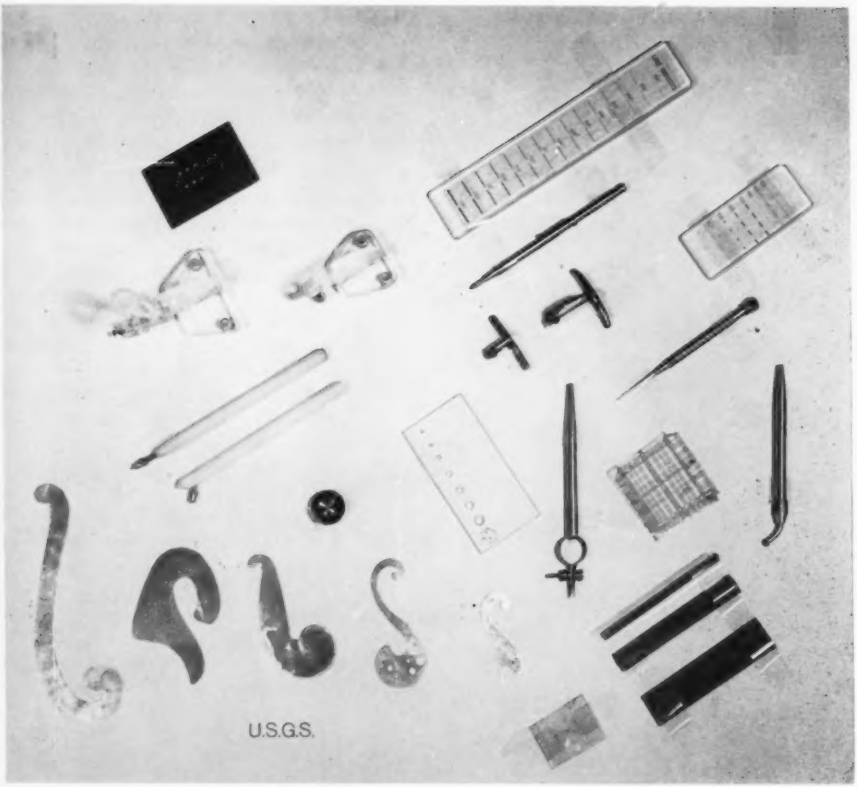


FIGURE 4.—Miscellaneous "side arm" equipment.

istics than type A, and it was indicated that the humidity effects on dimensional stability for type D may be less than for Vinyl. Unfortunately, photo-sensitive Mylar may not be in production for a year or more, but I understand that K&E has been working on this problem and may soon have trial specimens to offer. In view of the great strength of Mylar, it appears to be an ideal base for stripping film and it is hoped that there will also be production in this area soon.

Glass is still superior to the sheetings just discussed in hard-surface, dimensional stability, and longevity characteristics, but, because of the handling and shipping problem, most agencies have chosen the relatively light and less damageable sheetings for negative scribing

SHEET COATING

The apparently simple operation of sheet coating has given plenty of trouble during the past year. There seems to be a very thin zone of optimum quality between the hard and soft textures of coatings. Those on the hard side tend to chip and break down when line work is tight, while coatings on the soft side tend toward filling-in, particularly when cuttings are not completely removed from the line work. Thickness and density are also important as the coating must have sufficient body to hold back the intense actinic light required in processing albumen- or casine-sensitized printing plates. We find that coatings of about one-half of one-thousandth inch thickness seem best, and that, texturewise, the cuttings

FIGURE 5.—Swivel graver with needles in place of flat blade.

should "roll out" clean, rather than crumble or "plow up."

Yellow FloPaque is the most favored coating material at present, with application by plate whirler or spraying, but I am sure that the current materials and application processes are not the ultimate best. Roller-coating and silk-screen processes may provide better working bases in the future, particularly the former, which can probably be mechanized more completely to eliminate some of the variables of touch and timing such as we have in the whirling and spraying methods. Humidity and perhaps certain elusive chemical variations are probably to blame, in part at least, for some of our current difficulties. Wagner of St. Louis, American Blue Print, and K&E have produced some roller-coated sheets, but, for close and intricate work, these productions are not yet of the quality desired for close detail.

GUIDE-COPY EMULSIONS

There is not much of a problem in processing guide copy to the coated sheets. Black Watercote is very satisfactory, but ordinary blueprint solutions and other sensitizers may be used. Guide copy can be processed in full strength for scribing, which was not possible for drafting guides as the background had to be dropped out when the drawings were photographed for reproduction.

INSTRUMENTS

We still have great opportunities in the field of instruments although much has been accomplished during the recent past. As previously noted, scribing lends itself well to the use of mechanical aids, offering a wider development potential. For example, we were never able to develop a satisfactory stamping device for buildings and similar small symbols, and had to resort to tedious stickup to assure uniformity at reasonable costs. However, we readily produced a trigger device for scribing, that cuts buildings of good quality as fast as one can place the point on copy. Figures 1 to 8 illustrate the current instrumentation of negative scribing.

There has been a remarkably fine spirit of cooperation in the recent scribing development efforts, with an open-handed exchange of ideas, to the extent that we can truly call scribing a community develop-

FIGURE 6.—Soil Survey lettering machine.

ment. Government and commercial agencies are collaborating on many projects, and in this favorable climate we can expect the remarkable progress of the recent past to continue for some time.

DEVELOPMENT AGENDA

It may be of interest to mention a few of the items on the current development agenda of the Geological Survey:

1. General research on coatings.
2. Lettering and symbol guides by glass-etch and other processes.
3. Dotting machine for supplemental contours.
4. Improved sharpening jigs, to make this critical part of the scribers' task more mechanical and consistent.
5. Spacing devices of many kinds.
6. Reversing mirror—to view plates in "right reading" position.
7. Spading tools and solvents for large area clearing.
8. Sealer coatings to preserve finished sheets for later revision.
9. Softening applications for coatings which may have become brittle.
10. A complete manual of procedures.

The latter item is quite important, but is low on the current agenda because so many

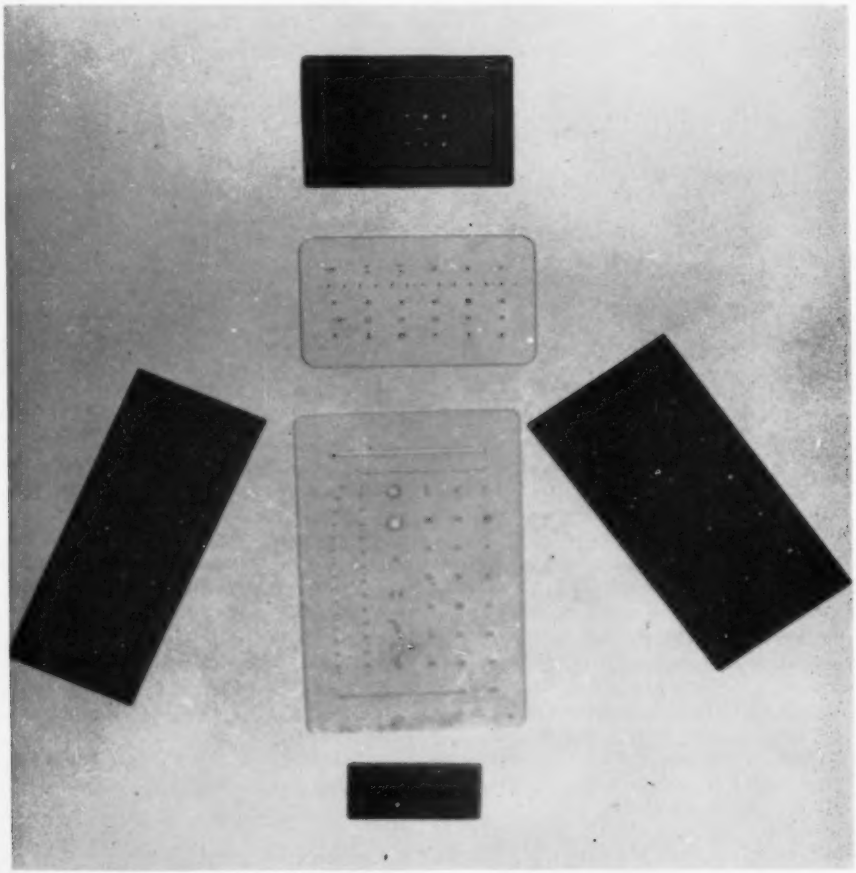


FIGURE 7.—Miscellaneous templets for small symbols.

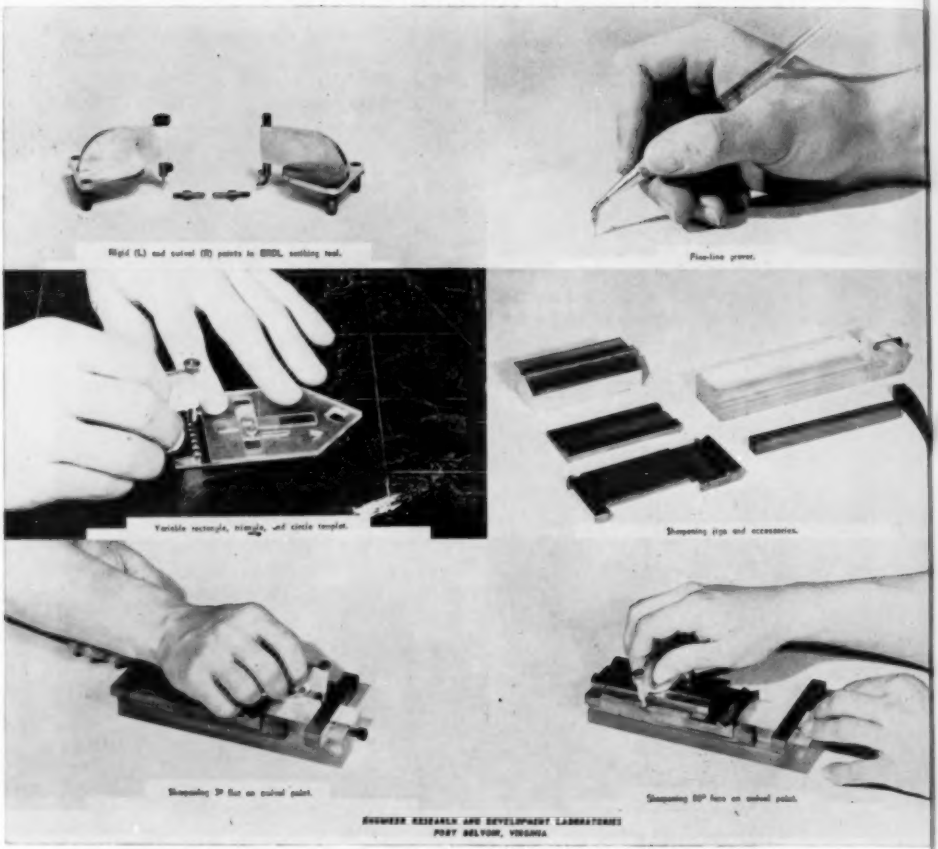

Rigid (L) and swivel (R) points in ERDL setting tool.
Fine-line pencil.
Variable rectangle, triangle, and circle template.
Sharpening pipe and accessories.
Sharpening 3° flat on swivel point.
Sharpening 30° face on swivel point.
ENGINEER RESEARCH AND DEVELOPMENT LABORATORIES
FORT BELVOIR, VIRGINIA

FIGURE 8.—Items developed by the Engineer Research and Development Laboratories at Fort Belvoir military field kits. These instruments are now undergoing production trials by mobile mapping u

operations, as now practiced, are subject to considerable change.

We have a few items which are only in the dream stage at present, but we have given them enough thought so that we feel some expenditure is justified to explore their possibilities. These include: a remote control scriber, operated manually by a lever following magnified guide copy; an electronic line scanner, to follow guide copy automatically; and a photo-lettering machine with x, y, and swinging motions to develop the entire nomenclature for each map on a single negative.

* * *

Plan Now for the ASP–ACSM Consecutive Meetings
March 7–11, 1955

Compulsory Ties to State Plane Coordinates?

By RALPH MOORE BERRY

REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR,
KENSINGTON, MARYLAND

MANY TIMES every year, and at many different meetings, one hears discussion on the question of ties to State plane coordinates. One would be inclined to believe that all possible phases of the question had been developed, all facets explored, and all points of issue discussed to the extent that no more ground for controversy could possibly exist. That such is not the case is, *ipso facto,* demonstrated by the very fact of the continuing discussion. An attempt will be made here to review the major points of issue and, possibly, to provide reasonable answers to most of them.

First, a word of explanation for the State plane coordinate systems. They are merely mathematical artifices to permit use of plane-survey field procedures and computational methods over distances that normally will not permit the ancient land surveyors' assumption that the earth is flat. By this means, entire States, or large groups of counties, can be related in single coordinate systems. The fact that this is an ingenious mathematical artifice, accomplished by the application of the theories of map projections, is very interesting and intriguing; but an understanding of these theories and mathematical manipulations is not essential to a satisfactory and intelligent application of the basic benefits of the State coordinate system to a simple survey. If one reads the texts and manuals in which the principles are discussed, and gets involved in Lambert and Transverse Mercator projections, one may get discouraged and come to the conclusion that the entire subject is too complicated for ordinary land surveying. The fact is that the subject *is* complicated but its application is not. The complications were all disposed of when the State plane coordinates of the basic control points were computed by the U. S. Coast and Geodetic Survey. It is no more necessary to understand the mechanics of this operation than it is necessary for an instrument man to be familiar with the principles of optical design in order to be a competent observer.

Presented at the Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954.

THE PROPOSITION AND ITS BENEFITS

Now for the proposition—*Every new survey filed for public record should be required to be tied to the State plane coordinate system.* By "tie to" is meant the determination of the State coordinates of principal corners of the property by accurate field-survey connection to control stations whose positions have been determined in the State plane coordinate system by control surveys of suitable accuracy and the public stating of these coordinate values on the recorded instrument. It is understood and conceded that this is simply not practicable if the control stations are not available within a reasonable distance, although no attempt will be made here to define "reasonable distance." This statement is intended primarily to include new subdivisions. It should also include any surveys for determination or redetermination of boundaries that get placed in public records, such as in deed descriptions by metes and bounds or land placed in the register. There can be little argument with the principle of this proposition. The value obtained has been stated many times. Primarily, there is the enormous benefit of preservation of position of property corners, which position, being related to the coordinate grid, is effectually beyond the reach of that archenemy of the land surveyor—the bulldozer. A secondary benefit is the correlation and inter-relation of widely spaced original marks which, once located, can always be related by computation, without revisitation, to subsequent surveys of adjacent lands. This can frequently

supply the answer to the economic question of how to locate the corners of a 50-foot lot falling on an original line a mile long. An archive of basic property points so located would be of inestimable value to any practicing surveyor in an area, and, as original marks continue to disappear by the irresistible march of natural attrition, the only possible reference to their original positions would be the record of their coordinate positions. How superior this is to the uncertainty of parole evidence or the necessity for shaving the ground in search of discoloration that might (or might not) indicate the former location of a wooden stake!

The benefits accruing to the land surveyor as outlined in the foregoing paragraph apply not only in the area of the Thirteen Original Colonies and in some others where the original land grants were made in a random, mathematically unsystematic pattern, but they apply equally as well to the Public Land States. Apparently some misunderstanding has arisen as to the fundamental use of coordinates. It has not been suggested that coordinates be used as a sole means of description or identification of parcels of land; local land-grant, conveyancing, and recording systems are too deep-rooted in tradition, custom, and law for such a proposition ever to be made or seriously considered, even though the traditional systems have by themselves, in many cases, completely failed in their original purpose of conveying, beyond reasonable question, both the legal entity of "title" and the inseparable, but distinct, entity of a physically identifiable, unique, portion of the earth's surface. It is proposed that coordinates be used only to strengthen and supplement the description of the physical part—not to supplant in any way the other descriptive material appropriate to the local system of land description. The necessity for complete recovery and recognition of original corners and the reconciliation of conflicting data in accordance with prescribed or traditional legal procedures is in no way to be abridged—but the manipulation of these data will be materially expedited and much repetitive field work eliminated with a consequent increase of quality and reliability if recourse be had to the coordinate method of preservation of original positions and the coordinate method of computation.

It is hoped that some of the apprehensions and misconceptions about the use of coordinates have been dispelled, and that it has been made clear that there is no suggestion that any traditional system of description be replaced by State plane coordinates. Any legal question about discrepancy between established monuments and coordinate positions can probably still be resolved by resort to the legal principle of precedence of physical monument over call for distance but could, in any event, be averted by special wording to that effect in the enabling legislation.

It will be noted that the above are direct and material benefits to the professional land surveyor. Other benefits, not so applicable to the individual surveyors, but of great value to local government agencies, are such items as facility in the preparation of tax maps and the compilation of more detailed property maps for the planning of highway routes, acquisition of park lands, and the control of subdivision in urban and suburban areas. Of value to mapping agencies, both on the local level and at higher, even national, levels is the fact that every property mark that is coordinated becomes a potential control point for photogrammetric mapping. Such mapping, when available and maintained concurrent with cultural development, is of inestimable value to a multitude of different types of users—not only engineers, surveyors, city planners, foresters, and geologists, but also to geographers, social workers, real estate operators, traffic expeditors, police and fire departments, agricultural advisors, economists, and even such non-professional users as farmers, fishermen, and hikers.

WHO FOOTS THE BILL?

Many surveyors, granting the theoretical desirability of connecting surveys to State coordinate datum, will raise the very practical question of cost. "Who is going to pay for the extra work involved?" There are several answers to that question, each pro-

viding, by itself, only a partial solution. First, the surveyor himself should be willing to make a reasonable effort to make these ties. He will benefit directly by it, as previously stated, through the preservation of position. He should also consider the expense partly as a capital investment because of the placing at his use of coordinated positions of difficulty-recovered important marks such as original landgrant corners, section or township corners, county or State boundary points, block corners, and so on, to which he will have continuing future reference as he takes up other assignments in the area. This refers in general to the cost of making the ties where the basic control points are located fairly close to the property and excessive control extension is not required.

If longer distances are involved, the surveyor should receive some assistance. At this stage, the control extension becomes the function of a local organization such as the department of public works or a more specialized agency such as the planning commission, highway department, water and sewer departments. All agencies of this nature have direct interests in the pattern of property holdings generally and also in separate parcels as they affect rights-of-way, public spaces, reservations, and so forth. Maps for studies in these fields must be coordinated and the agencies should be willing to make a major contribution toward the local control requisite for the preparation of these maps and thereby enable the practicing land surveyor to supply, as a regular part of his work, the necessary coordinated property data for the construction of the maps.

It is not expected that the local agencies will, except in rare cases, extend control for very long distances. This is not only specialized work for which qualified personnel would be difficult to obtain locally but also will require equipment, funds, and organization that a local agency cannot be expected to have available. It is the function of the U. S. Coast and Geodetic Survey to provide an adequate basic framework on which local control can be built with satisfactory accuracy and without need for long extension. Within the limits of available appropriations, the Coast and Geodetic Survey is continuing, year-in and year-out, with the work of providing this basic control. At present the objective is to provide triangulation stations in a network pattern at approximate 7-mile spacing, with an additional station or two in each incorporated community and also at approximate 5-mile intervals along main roads. In heavily-populated urban areas the network spacing is reduced to approximately 3 miles. This work cannot be done simultaneously over the whole nation; hence, the desired spacing may not have been effected in a given locality. If control is urgently needed for the basis of a control or mapping program, a request to the Director, U. S. Coast and Geodetic Survey, Washington 25, D. C., will obtain information as to the schedule for triangulation operations in the vicinity, and, perhaps, may result in obtaining the necessary basic control far in advance of its routine schedule.

It is not only important that the control be available locally at a satisfactory spacing, but it is also important that the control be consistent within itself. The optimum condition for meeting this criterion is that all the supplemental control in an area bounded by a set of basic control points should be run and the field data available before any adjustment is made. This is desirable to permit the simultaneous consideration of all subclosures in one final adjustment. It is also important that, at this stage, the accuracies of all the supplemental traverses be maintained at second order. Failure to meet these criteria can only result in confusion as adjusted coordinates give way to "readjusted" coordinates and a multiplicity of datums arises as new lines are added or as weaker lines are strengthened by rerunning with higher accuracy than the original. It even becomes necessary to "use a crowbar" to adjust new lines of higher accuracy to older fixed points of inferior accuracy. All this will only succeed in nullifying the inherent benefit of the use of coordinates—that of permanent preservation of position—and ulti-

mately lead to complete abandonment of the system by the very surveyors who stand to benefit.

MUTUAL ASSISTANCE VERSUS "DOG EAT DOG"

A suggestion is offered whereby some of the burden of the cost of the extension of supplemental control might be divided and the benefit of coordination simultaneously extended. First, in any locality, the land surveyors must have a local organization. Through this organization they benefit in many ways which are not within the subject matter of this discussion—in education and in encouragement of ethical relationships with each other, in standardizing procedures of surveying and presentation to clients, in studies of fees, and so on. The biggest benefit, however, is in the simple act of mutual assistance and cooperation. Without these, surveying practice is a "dog-eat-dog" business where each practitioner thinks ill, if at all, of every other practitioner, and maintains a file of "secret" data guarded with all the vigor of a custodian of national security information. This is done with the idea either that he will thereby obtain more assignments because of the secret information that he possesses or that he will be able so to confuse and confound his fellow practitioners that he will of necessity be brought in to rectify their mistakes. The first premise is almost entirely erroneous because prospective clients are usually neither aware of the fact that he possesses this secret data nor cognizant of the possible advantages thereof. The second is, of course, so far beyond ethical professional standards as to be unworthy of discussion. On the other hand, by free consultation and interchange of data and information, all surveyors accomplish their work more easily, waste less time in research and recovery, do better, more complete and more accurate work, avoid controversy and legal actions, and present a better professional front to their community.

Now, let us get to the principal point of this discussion. Would it not be a great convenience for all practitioners in an area to base all their important surveys on a common datum? In this way, exchange of data would be simplified and the correlation complete. Agreement as to common boundaries would be possible by office consultation and all would be certain of obtaining coherent surveys. This coordination would not be possible without access to the necessary supplemental control. How about extending the possibilities of cooperation by instituting a common project of extension of basic control by the surveyors themselves? Every surveyor must run or extend some control on his own behalf. If some of this effort were expended by joint operation in conjunction with the local association, a gradually expanding network could be made available to all through some central file.[1] This file could be maintained in some accessible private office or entrusted with a cooperative public office such as a city or county engineer's office, a planning commission, or highway department. In conjunction with this file of control points there should be an index indicating the various tracts and parcels of land for which coordinated boundary surveys are available and, in each case, the private office from which this data would be available to other surveyors.

It is pointed out that the use of a central cooperative system such as outlined above might provide some ammunition in the battle against unethical practitioners. In possession of such coordinated data, the competitive position of the cooperating surveyors would be much improved and the non-conformists gradually persuaded to join forces and thereby improve the quality of their work.

ADVANTAGES OF MAKING TIES COMPULSORY

In the foregoing remarks, an attempt has been made mainly to demonstrate that the private surveyors themselves will derive substantial direct and indirect benefit from coordinated property surveys and they can even afford to foot some of the bill for the

[1] *See* "Streamlining Local Control," by C. A. Wooldridge, Jr., SURVEYING AND MAPPING, April-June, 1954.

control. There are also sufficient secondary benefits accruing directly to local public agencies and indirectly to the general public to justify substantial contributions to basic control from public funds, but these must be pointed out to the appropriate authorities before their magnitude is realized. What better group to propose this than a well-recognized organization of ethical, respected, professional surveyors?

Some surveyors may take issue with the suggestion that the connection to State coordinates be made compulsory. There are two good reasons for this; one of direct benefit to the surveyors and the other of benefit to the public. First, it is suggested that, though the surveyors will concede the benefit and desirability of coordinate connection, they may not be able to include the cost of connection in their charges to their clients for the entire service because other less professionally-minded practitioners will not always include similar charges (nor the service) and thereby be in an economically superior competitive position. If all are required by law to make these connections, and in accordance with standard specifications, there will be no pricing advantage. Secondly, the large benefits accruing to public administration and engineering agencies, and to the public at large, amply justify the requirements. This is consistent with the principles on which the technical requirements governing the filing of plats and other engineering plans are justified.

The foregoing has also been presented with the expectation that any lingering doubts will be brought out in subsequent discussion where it is hoped that they can be completely dispelled.

Discussion

(EDITOR'S NOTE: Mr. Berry's paper was presented at a plenary session; the discussion was held on the following day as a part of a Property Surveys Division technical session. Chairman W. B. Williams called on Mr. Berry to give a brief synopsis of the paper, and then the floor was thrown open for discussion.)

MR. NORRIS (Texas): I would like to congratulate Mr. Berry on some of the statements, in particular the fact that the application is not complicated and gives a workable solution; that we don't have to worry about working out the coordinate system.

I do take some issue with the statement, as I recall it, that the private surveyor will be the main beneficiary. The intimation, as I understand it, is that as the main beneficiary, he should take over part of the cost of establishing closer control and bringing it into reasonable limits.

That is very questionable and very debatable. It is also very debatable whether I should plan to put those in a public record and make them available to my competitors, although some of them would use this information advantageously, and I frequently trade information with surveyors and engineers that will reciprocate and use that information.

As an illustration, in my area control points are established at intervals of about 7 miles; that is entirely too far for subdivision work. I could not pass that cost on to my client. I know of no way I could squeeze that kind of money out of my fee to tie to the work.

Also, rather than stating that second order is a minimum of accuracy, I think that accuracy will depend on the cost of the land and the work to be done at that time or the value of the land. As the value increases, accuracy increases.

Now, we do need to start on this control thing. For instance, speaking of Texas, where we already have a coordinate system set up, I doubt if such a requirement, passed by the legislature, would stand up in the court as being constitutional.

It is certainly desirable, but first we have got to find some way to get those control points closer to where the private surveyors can use them. Not only the private surveyors fail to use them, but our highway departments and a lot of our city and county engineers and surveyors make no attempt to use the coordinate systems as they are.

I have long studied and tried to evaluate some plan. It would appear to me that it is a cooperative thing between cities, towns, and the local interests, your county, State, and probably

the Federal government to get control and tie in a survey to the control system.

I'm heartily in accord with the need for it, but as to how we are to get it, I don't know. I think we need some more study along those lines.

MR. BERRY: I see you plan on beating out a definition of "reasonable distance." You can be assured I was not thinking in terms of 7 miles, but more likely in terms of 1 mile or perhaps even less.

MR. NORRIS: It would need to be less, I believe.

MR. BERRY: Also, a favorite author of mine had a character whose favorite expression was, "It should be ain't is."

MR. LARRABEE (New Jersey): I have just been preparing a local ordinance regarding subdivision control. In New Jersey, we have a law that requires the municipal engineer to insert in the regulation for his municipality a requirement for all subdivisions to be tied in with State control. I think we could suggest one thing here, that every time an engineer or surveyor has this opportunity, by all means, insert the requirement in the subdivision regulations which must be complied with in the community.

MR. WILLIAMS: The control points we have in my city are about 12 miles south and 8 miles north, respectively, and you can't see from one to the other without a tower.

MR. LARRABEE: My answer to that question is that a reasonable distance in our ordinance is a half mile from the edge of the subdivision. I would like to hear some other engineers express their opinions as to whether it should be a half mile, one mile, or two miles.

MR. NORRIS: Inserting the requirement is good, but we want something practical. I see no need to insert something that we can't get done. Now, half a mile in connection with a good size subdivision is probably all right because the cost would probably not be excessive, but in the case of minor surveys or minor resubdivision, even half a mile will become excessive in cost for the survey, and there is where I think the municipality or somebody is going to have to provide us some funds and they are going to have to be able to provide that reasonable distance some way.

MR. BERRY: In my paper presented yesterday, I said that was a three-way proposition. I said that the surveyor should absorb the cost of connecting from a reasonable distance and that the State and local authorities should provide the breakdown, the supplementary control from the Federal network and I was thinking of the Federal network as completed in accordance with the present plan and not as it is now.

MR. TEAS (New York): Regarding this matter of writing the requirement in the subdivision ordinance, requiring the surveyor to provide this connection with the established system, I don't think that it is fair to put it into effect until the State and the county in those areas are doing the same thing. Unless the States are connecting their highways according to this ordinance, unless the counties are already connecting their surveys and their through-ways and all those things are being done, why put it on the developer and surveyor until the other things have been done and have been in effect for years? Then it is reasonable for the surveyor to tie in; but to put it in an ordinance without making the other fellows tie in—I can't see that at all.

MR. BERRY: Mr. Teas, I find no argument with that amendment at all.

MR. LUCAS (Massachusetts): In Massachusetts, there is a law in any town that if a man is making a survey of a public street, the town is required to give him the accurate street line. All he has to do or all the owner has to do is demand it, so if we are required to tie in to State coordinates, there could be some ordinance that the State must give a control point within a certain distance.

Massachusetts also has a requirement that if the land you are registering is within a reasonable distance—I guess they don't specify what that distance is—of a control point, you will have to tie in.

Now, if a State has some law or some regulation requiring, for instance, land coordinates to tie to other land coordinates, eventually you would begin to get coordinate positions of a piece of property surveyed within 500 feet of your property. It would be coordinated. If the State highway department has to coordinate PC and PT points, eventually a system of points within a reasonable distance would gradually be built up and those control points would become closer and closer together.

MR. BERRY: To avoid confusion, all these coordinates have to be maintained in the position with a relative accuracy of, say, 1 to 10,000.

PROF. McFARLAND (Michigan): Isn't it true that the plat law in Michigan, tying in a plat with government survey, requires a lot of work and a lot of experience?

MR. BERRY: Many times we will have to run a half mile or a mile or we may have to subdivide a section in order to locate the nearest point to tie to, so it is not entirely unreasonable

that you should run a half mile or a mile to tie to a control point.

MR. BLAIR (New Jersey): May I suggest that the perimeter of the tract might be a useful and a reasonable distance.

MR. BERRY: I think that is understood, some point on the perimeter of the tract.

MR. BLAIR: I'm saying, what do you take as a measure of a reasonable distance? If you have a small lot, obviously, you cannot spend a great deal of money traversing a mile for control. I'm suggesting that perhaps the perimeter of the tract is a good measure for the distance of expansion of the control.

MR. BERRY: If you had a lot 50 by 100 feet, you could go 300 feet for control?

MR. BLAIR: That is right.

MR. BERRY: It is a bit strong but the idea is good.

MR. BOYCE (Connecticut): I have also been heartily in favor of the idea of tying to any control which might be available, but the more I think about it and look into it, the more it seems to become impractical. I assume that the reason for the tie is to describe the corners of the property, legally, by the coordinates. Is that not so?

MR. BERRY: I think the idea is the preservation of the position indefinitely even though the markers become obliterated due to destructive activity.

MR. BOYCE: The point there is that the more accurately the surveys are run, the more errors are eliminated; and tying the corners down would give you a particular position, no matter how you adjust it, or how the survey may be run through the tie or extension, which would naturally, as adduced, change the coordinate position as described in comparison with the actual description by the actual location of the point on the ground.

It seems to me that this is a fundamental obstacle that has to be overcome before there is too much value placed on the idea.

MR. BERRY: I'm not quite sure I understood the point, but I have assumed in all this that the original determination of the coordinates has been made with another undefined term "accuracy" and we have started out by tentatively assigning from 1 to 10,000. I have assumed that would give you a point that could be reestablished within the limitations necessary for the relocation or reestablishment of a property corner. We do have to assume that the control marks are fairly close to the station.

MR. WILLIAMS: If the control points are within half a mile, one-in-ten-thousand accuracy would locate that point within about two-tenths of a foot.

MR. BERRY: Something like that.

MR. BAUER (Ohio): There is one thing Mr. Schofield has mentioned privately to me that I would like to say about this: the emphasis so far in this discussion has been the value of the coordinate system by way of making a better job for the owner and to preserve the positions, as far as benefiting the owner is concerned. That is only a small part of the question. The bigger benefit comes to the practising surveyor himself who wants to stay in business and continue to stay in business in that particular locality. That is why it makes it a good deal more beneficial to him so that he would be willing to invest a little bit of extra money because if he is going to stay there five years, ten years, or more, he is going to need that point and it is going to be part of his stock in trade, and from that he will benefit more and more as time goes along.

CAPT. READING (Coast and Geodetic Survey): At the risk of being a little repetitious, I think there are two things I would say. One is that in order to get the accuracy that you fellows want, the control must be done as a unit and adjusted as a unit. If you run a traverse through here and run another traverse somewhere else, you lose a great deal of efficiency because, unless the control is adjusted as a unit, you will have one traverse fighting another as Mr. Berry, I think, did mention in his paper.

Now, another thing, that I was trying to say a little earlier in the Plenary Session: a very great value consists in the coordination and development of the country as a whole. In the United States, we have a political idea that it is up to the government to help the little fellow, the private businessman. The government helps the States and the States help the local fellows and that is a public sentiment that we can cash in and it is the right way to work and it fits us. We can't call on Congress as a select committee to make an appropriation for some work that is needed. We have to have the little fellow saying, "You are the government. You do what we need. You can give us the law so we can finance our roads and a little boost so that we can get the thing going." Everybody says, "Why, yes, we ought to help those fellows out."

If you get a certain spacing of control in your communities, adjusted as a unit, you can get the jobs to finish this up and get it paid for, to a great extent, by your community. You will get paid for it by the value it will mean to them in the development of the community just as a

good highway means development of the community. Once you get that, it is easy to sell to the rest of the country.

Now, just as a little byplay, the Federal Government of Switzerland pays 80 percent of the cost of those surveys that I was talking about.[2] The local pays 20 percent and the surveyors get the contract.

MR. NORRIS: I still can't subscribe to the fact that I have to spend my money for the control system to stay in business. It may be true in some places but that is not true in Texas. I work on the premise that if a job is worth doing, it is worth doing well, and at the same time, I have to make a little money.

Now, I am heartily in favor of a control system. I do a considerable amount of work in tying to coordinate control myself now, over and above the fees that I receive for the work, but I still don't know and I can't figure out where the cheap benefit is going to be to stay in business to get a control system.

MR. BERRY: Please, sir, I didn't say you should have to put in the control system merely to make the connection to it. Also, please, sir, let's not define "reasonable distance." Maybe it is this far (gesturing small) and maybe it is this far (gesturing large) but we certainly mean in saying "reasonable distance" a fairly short distance which is not going to cost you a lot of money to run. I do think that, for the little bit of money that it would cost, you would be a direct beneficiary.

MR. NORRIS: I will agree with that within reason, but to put in a control system——

MR. BERRY: I said in this paper I was not going to define "reasonable distance." That is a detail. If you want to devote a whole session to that, I'm in accord with trying to, but I didn't want to get involved in that. There are too many other issues I considered a little broader at the time. I said "should be ain't is."

I realize that I'm thinking in terms of a rather Utopian condition where all surveyors love all other surveyors and where they all work together, and that is my point.

MR. BELL (Kansas): I can see a definite need for this in our own problems at home. You fellows apparently have a big head start on us in a lot of ways. Out in Kansas, we don't register anything but Hereford bulls and engineers, and most surveyors don't even talk to each other. However, we still think we know how to do what you are talking about.

If some means of bringing control were available, I'm sure that I could speak for the fourteen surveying companies that I'm familiar with in the Kansas City area, and say that we would all be tickled to use it. We set up our own coordinate system in each subdivision now, like you do. It would be very little more trouble to tie to something, if there were something to tie to, but I'm like the gentleman from Texas, I don't want to spend over 10 percent of my time building controls.

Maybe if you fellows get this done now, when we grow up in Kansas sufficiently, we can follow your footsteps. I hope you do it.

MR. WILLIAMS: Gentlemen, it seems to be the consensus of opinion that many of us, and probably most of us, would like to work with geodetic control of some type or another. We can see advantages in the tying down of subdivisions in larger surveys, surveys of larger tracts of land, particularly, with State plane coordinates. The problem is to get more saturation of control points. Some of us talking it over drafted some rough resolutions to be presented to the Congress from this Division, and since I wrote it down, I'm the only one that can read it. I will take the prerogative of reading it to you instead of having some one in the group read it as would seem more proper.

Whereas, The American Congress on Surveying and Mapping recognizes the need for stabilization of control points, for private property and public improvements that will perpetuate their locations even though they may become lost or obliterated by acts of man or nature; and

Whereas, the U. S. Coast and Geodetic Survey has established a system of plane coordinates for each of the respective States and established the coordinates of a limited number of control points in each State; and

Whereas, this method of perpetuating control points appears to the American Congress on Surveying and Mapping to be the most practical method of so doing; and

Whereas, the establishment of additional control points has not progressed as rapidly as we feel necessary; and

Whereas, the work of the various highway authorities who are continually engaged in the revision and extension of the highway network requires survey work of a magnitude and caliber suitable for this purpose; now therefore, be it

Resolved, that the Director of the Bureau of Public Roads be requested to require all surveys hereafter made for the so-called Federal-aid roads, be tied to the plane coordinate system of the respective States, and that monument points be established at intervals of approximately 2 miles along said highways and their coordinates

[2] *See* "Recent Developments in European Instruments and Survey Techniques," by Capt. O. S. Reading, in this issue.

recorded in suitable offices of the county in which they are located.

The thought behind this is that it is not going to be the final answer—merely a step in the right direction—and it will be one method of extending the coordinate system out through the various States.

It can be done very simply by selling one bureau, instead of having to sell to the legislatures of each of the forty-eight States. It is something that will require only very slight additional work on the part of the respective highway departments and which will be very simply administered by the Bureau of Public Roads requiring the coordinate points to be put on the Federal-aid highways. The further thought is that, once it is started in that way, the State highway departments will see the advantages of it as they have in two or three of the States that I know of, and it will be carried on by the other States and, possibly, we hope, down to the county level.

With that word of explanation, I would like to recognize anyone that cares to make that in the form of a motion, if the adoption of such a resolution meets with your approval.

MR. SNOW (Massachusetts): Mr. Chairman, I would suggest first, a change from "two miles" to "one mile" as not being too excessive. If that change were made, I would recommend the adoption by the Division.

MR. WILLIAMS: In order to make this change, I wonder if anyone would care to comment?

MR. BLAIR: Second.

(A lively, extended discussion of the motion followed. It was then voted, unanimously, that the resolution be presented to the Board of Direction substantially as read but incorporating Mr. Snow's amendment from "two miles" to "one mile." The resolution, in final form as approved by the Board of Direction and sent to the Director of the Bureau of Public Roads, appears under "Congress News" in this issue.—ED.)

For the Best Service under the Worst Conditions

Chrome-Clad LUFKIN "Peerless" Engineers STEEL TAPE

An extra strong, ¼" wide Chrome-Clad line built up by a series of electroplatings — most rust and corrosion resistant — will not chip, peel or crack — easy to clean! Jet black markings bonded right to the line — can't wear off — easy to read against the chrome-white surface! Preceding foot number is repeated each inch or tenth. These features add up to the Lufkin "Peerless" — a durable steel tape made for engineers. Available in 50, 100, 150 and 200 ft. lengths. Two finger rings furnished for use without the frame.

282

BUY LUFKIN TAPES • RULES • PRECISION TOOLS From Your Supply Store

THE LUFKIN RULE CO., SAGINAW, MICHIGAN
132-138 Lafayette St., New York City • Barrie, Ontario

Australian Comments on the Torrens System

(EDITOR'S NOTE.—Of particular interest to property surveyors and others interested in realty titles.)

Foreword

Because Australia was the birthplace of the Torrens System of Land Registration, the following article from the Brisbane Division of the Institution of Surveyors, Australia, is an authoritative bit of information worthy of your careful thought.

The Torrens System of Land Registration[1]

YEARS AGO in Australia under the "Old System" it took years of search through transactions to determine clear evidence of ownership of a parcel of land. This was extremely cumbersome and was superseded by the Torrens System where the registered owner is in the eyes of the law the true owner of a parcel of land.

As time has gone on the mutations have obscured the identification of the realty. Errors in boundary identifications have occurred and been accepted but the original boundaries as laid out and marked by the original surveyor are the true boundaries. It can often be shown that original boundaries have not been adopted during some subdivision and future subdivisions have followed these boundaries. It can sometimes be shown that one owner of an old subdivided block suffers and if appeals were made it would seem that the original boundaries would stand, possibly cutting severely into the small blocks adjoining.

It is the duty of surveyors to give this R.P. [Registered Proprietor—Ed.] business some thought. We now have ease in proving ownership and increasing difficulty in identifying the realty to which ownership refers—say 20 plans to study in determining boundaries—a veritable chain of evidence. What can we do? Suggestions please, R. P. experts ! ! !

COMMENT BY W. S. DIX

Apparently the Torrens System[2] itself is not a panacea; *alia tentanda via est*—another way must be tried. This Australian predicament should promote serious consideration by American property surveyors of the importance of perpetuating surveys by tying important property markers into established coordinate systems. Any system of land registration becomes faulty in time if the descriptive and legal records can no longer be matched to authoritative identifying marks upon the ground. Original marks destroyed or otherwise lost can be accurately relocated from other coordinated monuments, regardless of passage of time, if those original marks—or recovered marks—are tied to established coordinate systems and the values recorded. Although also not a panacea in themselves, coordinated values are, however, powerful medicine toward *recovery*.

Perhaps a bit of allegorical explanation for the many without knowledge of the Torrens System might help in their understanding of the Brisbane dilemma. With volumes of original records, including grants and aboriginal tribal holdings and so on, to worry through in a young pioneer country, it would seem that youth and energy moved fast and research for titles moved slow. At that time, Sir Robert Richard Torrens, then adjusting matters in the prospectus of the new surroundings, borrowed a page or two from the book on marine registry and *landlubbered* it for transfer of property

[1] Reprinted from *The Australian Surveyor*, December 1953, page 245.

[2] Readers interested in further information on land registration and on the Torrens System are referred to the following:

MORRIS, FRED C.: Your Land—Surveys, Maps, and titles (Bulletin 71, Engineering Experiment Station Series), *Virginia Polytechnic Institute*, Blacksburg, Va. 75 cents. Pages 69–89.

DOWSON, SIR ERNEST, and SHEPPARD, V. L. O.: Land Registration, *Her Majesty's Stationery Office*, P. O. Box 569, London SE. 1, 1952. 1 pound, 5 shillings.

under certificate of ownership and introduced it in 1857 as a more practical registration system for land transfer than the older deed to ownership ideas.

As in case, say, the good ship Lazy Belle of 20 tons, etc., formerly registered in the name of Captain Bligh, might, for due cause and sufficient equitable exchange suitable to parties 1 and 2, be now quickly and simply registered in the name of party 2; land could be transferred under Torrens certificate, using perhaps some description from the written deed and an erstwhile survey plan—possibly like so many of our *early* own—in negotiations to suitably adjust the ship matter to a land matter of registry.

If land rotted or rusted away like old ships, perhaps the dilemma in Brisbane would not now be called to attention. But land does outwear ships and apparently landmarks do the rotting or rusting away or become otherwise lost and so land obviously also outwears description and identification.

So where laboring through volumes gave way to a quick paper registry, now tedious research is in reverse by reason of having to backtrack through subsequent registrations and plans to try to find reconciliation of registry description to plan, and both or either to anything reconcilable on the ground or by occupancy.

It would seem that the early Torrens cure apparently eased the stomach pains but now the repeated use of the medicine causes headaches. (Not too different, perhaps, than many of our own land title problems—which ties to established coordinate systems in supporting record might help to cure.)

❦ ❦ ❦

Adoption of International Nautical Mile

BEGINNING on July 1, 1954, the U. S. Departments of Commerce and Defense will use the International Nautical Mile in lieu of the U. S. Nautical Mile. This decision, replacing the U. S. Nautical Mile of 1853.248 meters (6080.20 feet) by the International Nautical Mile of 1852 meters (6076.10333 . . . feet), confirms an official agreement between the Secretary of Commerce and the Secretary of Defense to use the International Nautical Mile within their respective departments.

The use of a mile derived from the length of a degree of the earth's meridian is very old. It is believed that the Chaldean astronomers determined the length of such a unit. Miles of this sort have been variously called meridian miles, geographical miles, sea miles, and nautical miles, and they have differed greatly in magnitude, some of the values providing 10, 12, 15, and 60 miles to a degree. The British and the U. S. Nautical Miles were each derived by taking 60 nautical miles per degree, but the values adopted were not the same. The nautical mile adopted by the British Admiralty equals 6080 British feet, while the U. S. Nautical Mile has had the adopted value of 1853.248 meters, from which the equivalent 6080.2 U. S. feet has been derived.

In 1929 the International Hydrographic Bureau obtained an agreement from a large number of countries to adopt a value of 1852 meters for the nautical mile, the unit thus defined to be called the International Nautical Mile. However, at the same time Great Britain, the U. S. S. R., and the United States did not accept this value.

Finally, in 1953, at a meeting of an informal group from the Department of Defense and the Department of Commerce, the general situation regarding the nautical mile was discussed, and the belief was expressed that a change from 1853.248 meters to 1852 meters would not affect nautical charts, the calibration of navigational instruments, or navigation. The Departments of Commerce and Defense agreed to accept this value as of July 1, 1954.

Maps and Marketing Studies

By CHRISTOPHER M. WELD

RAND MCNALLY & COMPANY

THE PERFECTIONIST may be somewhat disturbed to know that businessmen, for the most part, are not greatly concerned with extreme accuracy in maps. They are more interested in relatives—in terms of size, distance, and importance. Commercial maps show these things, often at the sacrifice of the cartographic ..cellence prized by geographers. It might almost be said, in fact, that business executives need charts—not maps—to help steer a safe course through the complex maze of markets that is the United States today.

The commercial map is certainly a prime tool in the effective exploration of the problems of sales administration and control, marketing, and distribution. This has not always been true. For one reason or another, it has taken some time for business to gain a full appreciation of how a map, properly used, can provide a better visualization of solutions to sales and marketing problems. Perhaps the trouble stems from early school days when a map was presented as something complicated, full of special symbols and projections, almost as hard to read and understand as a blueprint. Perhaps it is because commercial map salesmen were not entirely conscious of the service they could perform by educating businessmen to proper use of maps.

Times have changed, though. Schools today have adopted a much more interesting approach to maps. Business schools and commercial courses give them the emphasis they deserve. Map salesmen have discovered that they can help themselves as well as their customers by taking a little time for education. Most of all, however, the commercial map, as exemplified by the road map, has become such a commonplace object that it is now accepted without suspicion and is widely regarded as an extremely valuable tool, if not a necessity.

A commercial map can be detailed or general, extremely accurate or purposely distorted. The only thing common to commercial maps is that they are all designed to cope with some facet of the business problem. Perhaps if we examine two or three specific problems brought to us at Rand McNally we will see how important maps can be in helping business.

MAPS AND THE DISTRIBUTION OF GOODS

Not long ago a meat packer and distributor asked that we help him analyze his jobber setup. Like so many others, his was a haphazard sort of organization, formed many years ago and changed through the years as the occasion demanded. His records included typewritten lists of jobbers and the territory served by each. Plotting this information on a map was, of course, our first step. With each jobber area outlined, it became perfectly plain that there were large, important segments of the country which had no representation, while other areas were served by two, three, and even four jobbers. By this simple map exercise, it was possible to show the distributor his weak and strong spots, and enable him to reorganize on a much more efficient and profitable basis.

Here is another case. An auto accessory manufacturer, who had previously confined his marketing efforts to a small part of the country, decided to expand. His new field was to be the entire United States, and he planned to have some 25 or 30 wholesaling points, each of whose area was to be about the same in sales potential as its neighbors. On the face of it, this seemed like a pretty formidable proposition—the United States, as noted above, is an extremely complex market, or group of

Presented at the Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954.

markets. However, many of the difficulties disappeared, once a properly selected map and some common sense were applied to the problem.

We decided first that, because the manufacturer's product had a direct relationship to the incidence of automobiles, we would use the county distribution of passenger cars as the prime factor in measuring his potential. Then we tentatively selected 25 wholesaling points and, on a county outline map, marked off an area around each point so that each area contained 1/25 the total car registration. Before the job was finished, certain adjustments and refinements had to be made, even to the extent of changing one or two wholesaling points. The end result was, however, a workable plan which the auto accessory manufacturer could utilize with confidence.

There was another distributor—a man who operates a large bakery which serves one of our major cities and its suburbs. Every morning loaded trucks leave his bakery in the middle of the city and fan out in all directions. Some trucks were loaded almost beyond capacity, while others were no more than half full. This was not because the salesmen were more successful along some routes than others. It was simply that the shipping department was operating on the premise that distribution of customers was the same as it had been fifteen years earlier. A map of the city showed the bakery management its error. The map was subsequently subdivided into zones, and the number of potential customers plotted in each. By combining the zones—taking into account their distance from the starting point—it was possible to reorganize the entire system so all trucks put in the same hours every day, and all orders receive attention at the same time.

These are but a few examples among many. It might be said that they are not examples of business people using maps, but rather Rand McNally's application of maps to specific problems. The fact remains that the three concerns could have helped themselves just as effectively if they had realized how important it is to have the clear picture of the market that a map affords.

MAPS AND TRADE POTENTIAL

Now, let us look at a rather typical sales problem—one that occurs every day—the development and recording of sales areas. To see what can happen, let us take a hypothetical situation and follow it through. The Standard Manufacturing Company makes greeting cards which have a wide appeal and are used by almost everyone at one time or another. The sales organization, consisting of twenty salesmen, contacts stationers and book stores. The sales manager is, naturally enough, anxious to let his men have the maximum opportunities for sales on as equal terms as can be arranged. This means that the twenty sales territories must be constructed scientifically. Certain peculiarities may come to light later which will call for minor adjustments of the territories we are going to draw now, but we must have the picture as nearly right as we can make it.

The sales manager decides first of all that his greeting card market is closely related to the incidence of total retail business. In less literate parts of the country, he has discovered, retail sales are off—and so are his,—even though the population may be as large as in more literate sections. His study shows him, for instance, that retail sales in Connecticut are running at a rate of two and a half billion dollars a year, while South Carolina with 100,000 more people spends only about half that amount. So he decides to let his territories follow the pattern set by retail business as a whole.

The next question faced by the sales manager is how to make his county combinations so that all territories have equal potentials. He can do this the most obvious way, starting at any extreme corner of the country, adding retail sales figures county by county until he has reached one-twentieth of the U. S. total, then seal off the area and call it a territory. If he uses this method he will have illogical and quite unworkable territories. A much better procedure is to use two tools which are

already available—the trading area and the sales unit. Several research organizations have published trading area studies, some with more, some with less merit. The same is true of the sales unit, which can be defined as a qualitative or quantitative measure of the purchasing power of a county or other area, simplified to the point where it is convenient to handle and entirely workable.

Let us discuss for a moment the trading area as most marketing men see it. This will give a better idea why trading areas are so important to the solution of a sales manager's problem. A trading area map, designed for the broad class of consumer goods, shows the principal marketing centers of the country and the territory from which each draws. The areas are based upon a factual study of the conditions that control buying habits. No sales or other factors which relate to a single product or group of products are considered. Only those elements are calculated which are common to all distribution and which are not to be disputed, such as rail and suburban transportation facilities, the condition, number, and direction of roads and highways, newspaper circulations, radio coverage, topography, man-made deterrents to trade such as toll bridges, the grouping of smaller trading centers, industrial opportunities, and so forth. Trading area boundaries are placed along county lines because most statistics are tabulated by counties. We realize that political boundaries

A trading area map gives sales manager and salesmen alike a visual understanding of their markets.

usually have no effect on trade and that the result is not an entirely truthful picture. However, it is more important to have good statistics with marketing area boundaries to which they can be applied, than to have absolutely correct market areas with statistics that don't fit them.

The 451 basic trading areas which appear on Rand McNally's map give a sales manager a fundamental picture of "buying habits." That is a term we use advisedly, and in preference to "retail trade," because it is plain that there are far more than 451 retail trade centers. In fact, a retail trade center may be anything from New York's Fifth Avenue or Chicago's State Street to the general store in the piney woods of southern Georgia. Obviously, it is impossible to show all such areas on a map. The trading area map permits the sales manager to make combinations of areas larger than individual counties with the assurance that, as long as he adheres to basic trading area boundaries, he will have homogeneous territories. Furthermore, since the basic areas are constructed with an eye to the highway pattern, each salesman will have no difficulty in reaching every part of his territory.

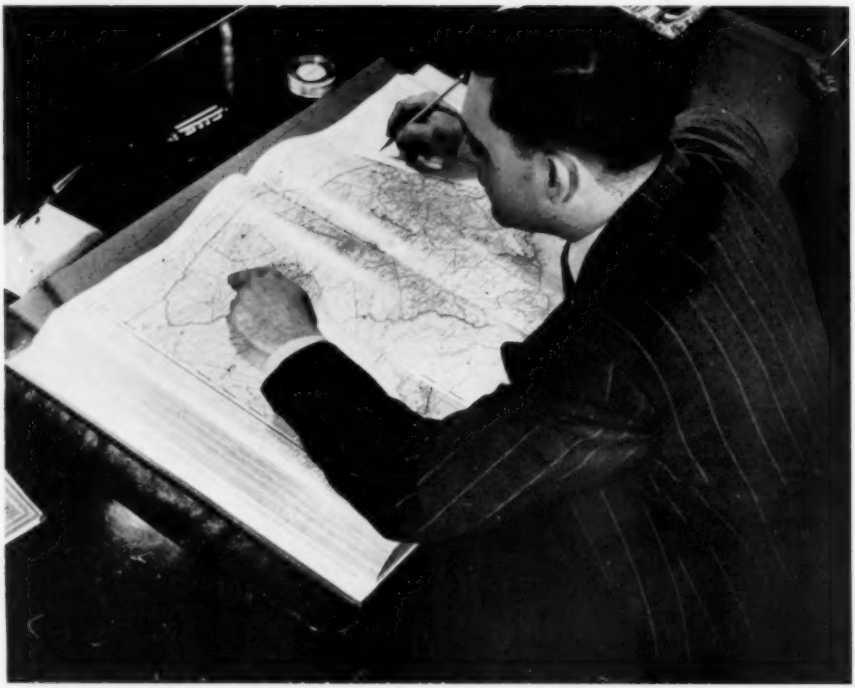
Further combinations of basic areas are made to form major areas. This gives a more general picture of the country's buying habits, and of the extent and direction of influence of the nation's largest markets. Conflicting claims, with regard to trading areas, are made by chambers of commerce, newspapers, and civic organizations. Rand McNally, and others who have been so bold as to publish trading area maps, is thus open to criticism. We know this and are not prepared to defend the major trading area boundaries to the same extent as we will those for the basic regions.

The sales manager turns to the trading area map as one of the tools to be used in outlining territories. What about the other —the index of buying power or buying expectancy—which we abbreviate to the simple term, "sales unit"? There are a number of such units, each with its own use. The simplest and the one with the most general application is the *Ranally Sales Unit*, developed by Rand McNally's Market Research Department. There's no mystery about the *Ranally Sales Unit*, no complicated formula connected with it. It's simply a uniform measure of the volume of retail business in terms of dollars. It's a measure of the money actually spent, not the amount available for spending. Instead of dealing with unwieldy seven- or eight-digit retail figures, the sales manager has the relatively easy task of making his computations with two-, three-, and four-digit *Ranally Units*. It should be emphasized that one *Ranally Unit* has the same dollar value in all parts of the country and for any year for which good retail sales figures can be had. Thus, sound comparisons can be made over a period of years and for any section of the country.

We have now given the Standard Manufacturing Company's sales manager his second tool. All he need do now is to combine trading areas until the total of *Ranally Sales Units* in each area reaches one-twentieth of the country's total. The end product is a map on which twenty sales territories are logically plotted, and on which all necessary adjustments for expense of coverage, distance from the home office, and strengths and weaknesses of salesmen can be made. Increasing the potentials in a few territories to compensate for high costs of operation, and making other essential refinements are the final steps. In a relatively painless way he has developed a basis for a sales organization which has every chance of success. Without the information supplied by good maps and marketing tools, the end result would have been much more complicated and unsatisfactory.

MAPS AND BUSINESS STATISTICS

None of the steps described above could have been accomplished without the great wealth of statistics available from the Bureau of the Census. Let us take a closer look at the part the Bureau plays in the marketing man's activities. By and large, business has two basic sources for data—its own records and official Census reports. To the marketing man, both sources are invaluable. Most companies have volumi-



New potentials are uncovered with the help of Rand McNally's Commercial Atlas and Marketing Guide.

nous records in their accounting departments. Without the data which only the Census Bureau can provide, the marketing researcher is as helpless as a man trying to run a 100-yard dash with one broken leg. There are a number of private agencies which can supply him with a crutch—in the form of estimates—but he cannot make his best race unless he has full and accurate statistical information.

Business is interested in all studies made and published by the Census Bureau, but those which are of prime concern are the Population Census and the Census of Business. Population records have been enriched since 1950 by a series of special studies and special censuses, supported by the activities of such excellent agencies as the State Census Board of Washington, the Los Angeles County Plan Commission, the New York Department of Commerce, the Kansas State Board of Agriculture, and the California Department of Finance. The need is still great, however, and business is hungry for more and better statistics. This is particularly true for retail, wholesale, and service sales and receipts data.

The most recent business census, covering the calendar year 1948, was taken in 1949. Another, scheduled for 1954 to cover the previous year, will not be taken because no appropriation was made by Congress. This leaves business floundering, as 1948 data is almost useless. The Census of Manufactures, last taken in 1947, has also been abandoned, and the County Business records will be abridged next year. Business must, therefore, rely on its own records and hope that arbitrary quotas are met—quotas which must necessarily be set up without regard to changing conditions because there is no accurate way to meas-

ure the extent of the changes. An alternate solution is to utilize the various estimate and sampling services which have been organized to fill the need. It is inevitable that business will make mistakes—serious mistakes. Business researchers must continue to make their needs known in Washington. Facts are needed, not guesses, the kind of facts which come from a regular, periodic census-taking program, the kind recently recommended by the special nine-man committee, appointed by Secretary of Commerce Weeks, to study census activities. Whether such a program will be reinstated or not remains to be seen, but it certainly has the whole-hearted support of business.

Up to now, we have been discussing the internal application of maps in business. The external application of maps, through which management promotes its goods and services and improves its public relations, is also gaining impetus. Use of maps in annual reports is one example. The trend today is away from the stereotyped report crammed with forbidding statistics, statements, and lengthy text. In many of the country's leading corporations there is an awareness of the public relations job the annual report can do, if it is written in a light, understandable, and informative style, and with plenty of illustrations. What better way is there to show the company's operations than on a map? The Greyhound Corporation includes a system map showing the points served and the roads travelled by its carriers in its report. The Pacific Lighting Corporation highlights on a map the communities it serves. The El Paso Natural Gas Company maps out its natural gas fields and pipeline networks, and many other corporations are also using graphic methods to tell their story to shareholders.

MAPS AND THE GOOD WILL OF CUSTOMERS

Another external map use is in the premium field. By this we mean any sort of good will or sales promotion program conducted by a manufacturer among present or potential customers. Some premium programs are on a self-liquidating basis, in others the manufacturer absorbs the cost. In either case, the manufacturer seeks to capitalize on the public's interest in maps, atlases, or globes. The outstanding example is the road map give-away program sponsored by almost all the oil companies. There are others. The State Farm Insurance Companies of Bloomington, Ill., through their agents, present atlases to policy-holders or prospects as a reminder of their services. This has proved to be a very effective program because people rarely throw away an atlas. Radio stations, and sponsors of radio programs, offer to their listeners maps which show areas of world conflict or tension, election results, sports information, and so on. Companies in every conceivable line of activity find this practice pays off handsomely in increased business. The field of premium maps is a wide one and actually produces more revenue to commercial map companies than the maps sold for internal consumption.

In view of all this we are forced to conclude that the commercial map is here to stay. The constantly changing face of the country, of which mapmakers are so well aware, makes it imperative that wide-awake management regard the map as one of its most vital tools. And, happily, management seems to be doing just that.

❦ ❦ ❦

PARK AERIAL SURVEYS, INC.

Est. 1920

AERIAL PHOTOGRAPHIC & TOPOGRAPHIC SURVEYS

STANDIFORD FIELD LOUISVILLE, KY.

Monument Restored on George Washington Survey Landmark

A TWO-SENTENCE theme by a seventh-grade Arlington, Va., schoolboy who had difficulty in writing and spelling has resulted in the restoration of a monument marking an old survey landmark established by George Washington in 1748. The boy reported in his theme that he had seen a stone bearing an inscription about George Washington fallen into Four-Mile Run in Arlington's Glencarlyn Park. Other youngsters corroborated the story and their teacher, Mrs. Esther Wohl, did some investigating. It was learned that the stone was part of a monument erected years ago to mark a white oak tree on which young George Washington had cut a mark for his land surveying work.

The class took upon itself the project of having the monument restored. The seventh-graders contacted the Thomas Nelson Chapter of the Daughters of the American Revolution who had, with the Glencarlyn Community Association, erected the first marker. The D. A. R. responded wholeheartedly by ordering an attractive plaque and arranging a dedication ceremony. The County Recreation Department was called for permission to restore the marker, as it stood in a county park. The department not only gave permission but recovered the pieces of the old monument from Four-Mile Run, cemented them together on a good base, and built a sturdy fence around the monument. A troop of Girl Scouts who had picnicked at the site also joined in the project.

The new plaque bears in gold letters the inscription on the original marker, now almost illegible:

On this spot stood an oak tree bearing the survey mark made by George Washington which became a monumental survey named in many deeds.

On May 21, 1954, the restored monument with its new descriptive plaque was dedicated at a ceremony attended by representatives of the D. A. R., the County Recreation Department, The Glencarlyn Library, the Girl Scouts, the seventh grade of Wakefield High School, and

YOUNGSTERS PARTICIPATE IN DEDICATION OF PLAQUE

the American Congress on Surveying and Mapping. The presence of an ACSM member, appropriate as it was, was quite accidental, for the son of the ACSM Publications Committee Chairman had, by what might be called a fortunate coincidence, been chosen to dedicate the plaque —and this accounted for the ACSM representation.

❦ ❦ ❦

Plane Coordinate Projection Tables

STATE plane coordinate projection tables for the Hawaiian Islands and the States of South Dakota, Michigan, Vermont, Rhode Island, New Jersey, New Hampshire, and Nevada (Special Publication Nos. 302, 312, 313, 314, 315, 316, 317, and 318, respectively) were recently issued by the Coast and Geodetic Survey. The tables in the new publications are used for the conversion of geographic positions to plane coordinates and plane coordinates to geographic positions. The methods of computation are designed for machine calculation using tables of natural trigonometric functions.

Copies of the pamphlets may be obtained from the Superintendent of Documents at prices varying from 15 to 65 cents.

Preserving the Old Order

By CARROLL F. MERRIAM

PENNSYLVANIA WATER & POWER COMPANY, BALTIMORE, MD.
PRESIDENT, AMERICAN CONGRESS ON SURVEYING AND MAPPING

ALTHOUGH not a land surveyor myself, I fully appreciate the concern which those who are in any way involved with law feel toward anything new which might upset custom, or introduce procedure unacceptable from the legal standpoint. Law is essentially a rule of conduct established partly by statute, partly by court decision, but the basis rests mainly upon accepted custom. The legal attitude is essentially conservative for the simple reason that, if people behave as they customarily have done in the past, their neighbors and those in contact with them in business and other relations know exactly what to count upon as common rights. This is as it should be, and we can regretfully look back on many examples where attempt has been made to legislate custom too drastically and contrary to public desire.

It is important, therefore, that surveyors should consider carefully any innovation, even though it may seem technically an improvement. There is justified fear that the background of past practice will thereby be so upset that legal considerations make any such departure risky, if not outright dangerous. The present system of metes and bounds, as found in our deeds, duly executed and recorded, has so long been the customary procedure that any change might be ill advised.

In approaching this problem, it is first necessary to appraise just what we have at present. There are, of course, the absurdly defective descriptions, such as no well-informed surveyor would write today, even though a prize example quoted in SURVEYING AND MAPPING for October–December 1953, page 530, bears a date as recent as 1946. We can only conclude that there are still at large surveyors who are not well informed, or at least one was at large eight years ago. However, we may leave out of consideration such curiosities and monstrosities, and confine attention from now on to what might be considered well written descriptions in the modern sense.

DEFICIENCIES OF OLD-TIME SURVEYS

What is a metes and bounds description? It is in effect a formula or set of directions by which, at a later date, the property may be identified, should question of ownership arise, by starting from the point of beginning and following successively the prescribed courses and distances to physical markers, which in themselves constitute the real witness as to the precise definition of the bound. Any discrepancy between the measurement and the position of the original markers is always judged in favor of the markers.

With recently completed surveys there is, at least for a while, relatively little to worry about because the measurements are made with greater care and precision than formerly for the reason that we have better means of executing the work than our forefathers had. It is now common practice to use only horizontal distances instead of slope measurement, and to observe angles to minutes where the old surveyor with compass never observed closer than quarter degrees. It is furthermore apparent that in the early descriptions no attempt was made to close the traverse by balancing the errors; and, as a matter of fact, there was a time when, in Maryland, even specifying the length and direction of the final course was forbidden by law. Hence we have the elu-

Presented at a meeting of the Maryland Society of Surveyors, February 10, 1954. The subject subsequently formed part of the program of the Conference on Surveying and Mapping called by S. S. Steinberg, Dean of Engineering, University of Maryland, as chairman of the Advisory Board of the Maryland Bureau of Control Surveys and Maps, College Park, Maryland, March 3, 1954.

sive phrase "and thence to the point of beginning," meaning that error, mistakes, and outright blunders have all been neatly buried and covered over.

In spite of such obvious shortcomings in the surveys of a few generations ago, retracement of bounds would not be bad if the markers which these surveyors had counted upon as permanent had lived up to their expectations. Here is the primary weakness. The monuments which seem at the time so substantial are, after all, disappointingly vulnerable. Sturdy oaks have fallen, wooden stakes rot away, pipes rust. If a marker protrudes above the surface it is liable to damage; if flush with the ground, it is soon overgrown and hard to find. Even government witness stakes are sometimes pulled up, apparently wantonly. "$250 fine or imprisonment" seems more of an invitation than a threat. Substantial concrete monuments become broken or undermined by changes in grade, while a new natural enemy of all types of survey markers —the bulldozer—now roams the country.

What you may expect me to suggest is to substitute for these markers, which have given so much trouble in the past, a mathematical prescription which defies time and even the ravages of the most vicious bulldozer. No, the physical marker is so much a part of our accepted law that no substitute is possible. We must, if anything, make the marker just as permanent as possible, stronger and more substantial, more resistant to the elements and vandals. Care should be taken to reinforce with calls, expressed in definite and unmistakable language, to nearby objects of as permanent a nature as possible, or by angles observed to objects too far away for direct measurement. Coordinates are definitely not the solution to the vulnerability of physical bounds; they form only an auxiliary means of retracement when all else fails.

COORDINATE SYSTEMS

It is theoretically true, and advocates of State plane coordinates would like to believe it true in the practical sense, that coordinates could be used to establish an exact position so that it could be restored in spite of complete destruction of everything within miles. I am confident that, in many instances, stations that I have established myself could be retraced within reasonable exactness, say to a tenth of a foot, even though an atom bomb should level all trace of any survey within a considerable radius, but I am far from sanguine enough to consider this a general rule, or to believe that a mere list of numbers in a deed description is in any way a guarantee to exact description of the land possessed by the grantee. It is a first principle that the physical marker as set in the field governs. It is a principle firmly imbedded in our law. To think of coordinates as replacing monuments is to disregard practical considerations in surveying.

The use of coordinates may be considered from another angle. Any prudent surveyor balances his traverse by using plane coordinates. For the immediate purpose it makes little difference what system he uses, and so ordinarily the origin is arbitrarily selected in order that all points should fall in the same quadrant, thus avoiding any negative coordinates. On completion of the adjustment of the station coordinates, the adjusted courses and distances are computed and become the description in metes and bounds.

It is of course necessary that the traverse be correctly oriented either to the magnetic meridian as of a given date, the geographic meridian as of the place of beginning, or, as in Maryland and a majority of other States, the State grid meridian. Ordinarily, the geographic meridian is used for the simple reason that the magnetic is now outmoded, and certainly to be discouraged for obvious reasons. On the other side, little use has as yet been made of the State grid, even 15 years after its adoption, a fact which is by no means regrettable.

As far as we have considered the problem, State coordinates offer no advantage that could not be secured by the use of a purely arbitrary local system as long as it is properly oriented. The advisability of the use of State coordinates at all is there-

fore seriously to be questioned. With nothing apparently to be gained and certainly with added expense involved in their use, the score so far is decidedly against the use of the State system.

In spite of this we must not overlook the fact that established systems of plane coordinates have actually been used for a number of years, and that in thickly settled districts, such as within the City of Baltimore, the Washington Metropolitan area, and in cities generally throughout the country, coordinates are looked upon as essential. There must be some reason for their justification and continued use in some localities for more than half a century. If coordinates were merely the products of academic thinking, the hobby of theorists, the inherent defects together with undue cost and inconvenience would certainly have been realized long before this. There must be some reason for continuance, even though the practicing surveyors have found much to criticize.

It must be granted that for the small survey, in which there is little if any advantage in ever connecting to any other survey, coordinates are definitely not interesting. Any advantage begins when one survey must be shown in relation to others, or when, taken separately, the extent in territory covered is such that convergence of the meridians begins to give trouble. A primary advantage, therefore, is that the surveyor with no knowledge of geodetic surveying, by using only familiar methods of plane surveying, can make a continuous map as big as the whole State of Maryland. Individual surveys, no matter where the meridian was determined, can be made to fit into a perfectly coordinated whole without any special technique. There is consequently no danger that, when surveys begun at different points meet, there will be common sides that appear to have different bearings.

In the great bulk of surveys for individual clients, such consideration may not at the present seem important, but in highway, railroad, transmission-line, or pipeline surveys, correction for the convergence of the meridians is an annoyance which is completely overcome by the use of plane coordinates. It is a great blessing when a centerline survey can be run continuously without correction for convergence, and all connecting property surveys as well as plans of affected structures made by other surveyors can blend on the same base.

LIMITATIONS OF SURVEY MEASUREMENTS

Just as the bulldozer is the natural enemy of the survey marker, so is inherent error the natural enemy of the work of the surveyor. We who are familiar with the nature of error, and the causes thereof, recognize the limitations of any work that we can do. We do know, however, that we can by proper care hold our errors, barring the blunders resulting from human frailty, to what we could consider reasonable limits. But the lawyer, if it is to his advantage, can prey upon this weakness all out of proportion, and can make mountains out of molehills. If surveyor A should describe a bound as having coordinates x and y, and surveyor B should describe the same bound with slightly different coordinates, the difference in position amounting to less than one part in 25,000 as compared with the total length of traverse that A and B would have to run from established points, nevertheless, lawyer C, if he desires, might say that neither A nor B knew exactly how to describe the position of the monument, and consequently the testimony of one or the other, or possibly both, was valueless.

Such a situation presents a grave danger, to be avoided as far as possible by foresight and clear understanding. We must not look upon the coordinates as actual measurements from two imaginary north-south and east-west lines, but rather as relative to surrounding coordinated points. It is possible that the reason that surveyor A and surveyor B got different coordinates is that they took off from different control points. The grid distance between these two starting points may be well within one part in 25,000 of the absolutely precise distance, but, when surveys extend to a common point, the slight discrepancy may become accentu-

ated. There may be no fault to find in either survey. This example emphasizes the responsibility which rests on the execution of the basic work.

Considering this case further, it will readily be appreciated that the basic inconsistency will be carried forward into the two surveys, which would seem a misfortune were it not for the fact that all of the points in any one survey are affected by the same amount and in the same direction. Consequently there is no more "relative error" in each survey than there would have been if purely arbitrary coordinates had been used in balancing the errors inherent in the surveys themselves. This means that the relative positions of all the bounds in each of the two property surveys would not be at all affected. If it were necessary to replace the bound in question after all physical evidence had been lost or destroyed, the surveyor to whom this unpleasant task fell would not be a bit worse off than otherwise. The reason for this is that the courses and distances derived from the balanced traverse would give exactly the same angles to be turned at the remaining existing bounds and exactly the same distances to be measured as there would be according to the present system of metes and bounds. Thus it is important to observe that, as long as there is no intent that a set of coordinates cited in a deed should give title to an imaginary point, then nothing is taken from the established system.

POTENTIAL VALUE OF COORDINATES

Now it is not sufficient to consider merely that nothing is taken away, even though this is in itself an important consideration. To justify coordinates it must be shown that some desirable feature is added. We must, therefore, consider what shortcomings there are in our present system which might be remedied by the use of coordinates.

It has been demonstrated that even approximate coordinates can be useful as a means of indexing locations. At present there is nothing which ordinarily appears in a deed to give any definite information as to the location of the property beyond its county and election district. Merely the coordinates of the point of beginning would be a tremendous help in eliminating deeds in which the searcher is not interested. Such coordinates need not be at all precise but could be measured from topographic maps or county highway maps, all of which now bear marginal ticks for inscribing the grid when wanted. With the new 7½-minute quadrangle sheets of the U. S. Geological Survey at the scale of 1:24,000, or 2,000 feet to the inch, once the grid is drawn, the coordinates of the point of beginning could be determined with an ordinary engineer's 20-scale close enough to be of service in indexing. Better still, the property could be listed according to the x-coordinate of the westernmost and the y-coordinate of the southernmost points.

To promote a more equitable basis for taxation, tax maps are now being drawn on which all properties are represented in proper relation to each other. The coordinates are a great boon in laying out the control points for any map, and particularly for maps at as large a scale as tax maps. Gone is the need for laying out the geographic meridians and parallels of latitude by the use of projection tables; fortunately, the State grid reduces everything to rectangular coordinates thus facilitating accurate plotting of all established points.

At the present time the official tax maps are being drawn at a scale of 600 feet to the inch; undoubtedly a larger scale will eventually be needed in the thickly settled areas. Consequently, in plotting this first series, a degree of accuracy which would seem appropriate for deed descriptions is by no means essential. If for each property the point of beginning could be specified within a tolerance of, say, 10 feet, even this would be well within practical limits of plotting and therefore a valuable aid in building up a wealth of information which is going to be of tremendous value to the surveyors in the future. At present it is necessary to work from controlled mosaics which in rolling country are bound to have

far greater error, and eventually considerable adjustment may be required when detail maps are to be made at larger scale. It is to the interest of the landowner to have his property entered as truly as possible in the correct position the first time, rather than to require adjustments later on.

It is hard to estimate the ultimate value of these tax maps when it comes to the planning of future highways and extensions to public utilities, but we have already sufficient evidence of the value of coordinated maps of this kind, and also have come to regret the cost where such maps are lacking.

Another serious shortcoming of our present system of registration of transfers is that there is no way of telling from the deed books alone, first, whether or not all of the land is accounted for, or second, how much is still unclaimed, while there is certainly no easy way of answering a third question —determining quickly if a new deed is in conflict with previous claims. A graphic representation, such as will be afforded by the tax maps when completed and kept up-to-date, is the best way of answering these first two questions. In addition to the third consideration concerning the conflict with previous claims, there is still another which may be of even greater importance from the point of view of future peace and well being. To what extent are there on record potential sources of trouble which coordinates might bring to light while the present owners are alive and amicable, rather than to wait for their heirs and assigns to fight over them? The coordinates may not be counted upon to define precisely an "imaginary" bound in contra-distinction to the real evidence in the field, but discrepancy in coordinates greater than could be accounted for by imperfections in the surveys can well show where the danger points lie. The chances are that the property owners have no idea that such discrepancy exists, and would be only too glad to come to a settlement rather than to leave after death an invitation to hostility. I have found among my neighbors in a little Maine coast village a great desire to have me witness mutual agreements regarding common bounds, and to have me tie them into the control of the Coast and Geodetic Survey. I believe that this opens up a large new field for the surveyor, a human service like preventive medicine.

TYING SEPARATE SURVEYS TOGETHER

What else can the coordinates do to add to the economy of the surveyor's work? In the vicinity of thickly settled districts there is springing up a crop of high structures, such as radio and television masts, new churches, transmission lines, factory chimneys, and water tanks. The Maryland Bureau of Control Surveys and Maps has, to the extent of its ability, been cutting these points in, not as picture points for maps, as they were formerly regarded, but as control points to assist the surveyor. After some years of experimentation it has been found that, if they are well coordinated, they can effectively serve the surveyor in extending the control that he may need, and thus in many cases avoid connecting traverse. Such connections may often make practical the tying in to State coordinates where otherwise the cost would be prohibitive.

This is by no means the whole story, for again it could be argued that if there were nothing to be gained by connecting to the State net then why do it at all? What is hoped to be accomplished is to furnish the surveyor a means of helping himself in those embarrassing cases when traverses fail to close. The tedious and time-consuming search for the blunder can in many cases be greatly shortened if, while the surveyor is in the field, even an approximate angle is turned to coordinated landmarks. The value of this check becomes greater as the work of coordination progresses, but even at present the possibilities in certain districts warrant consideration by the forward looking surveyor.

One of the greatest potential sources of economy is found when it becomes necessary to unite separate surveys made at different times for different purposes as a single map for some project such as a bridge or public improvement. It is a great source of satisfaction to see an old survey given rebirth in

new utility unforeseen many years ago. This is only possible by reference to the common base.

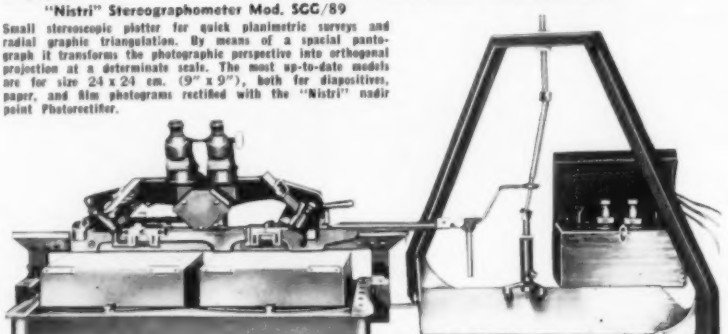
It may be too early to contemplate what the distant future may have in store, but at least one State has pioneered in taking definite steps to relieve the ever-increasing burden in the transfer of property. Here is the crowning glory of the work of the surveyor who looks to his profession as something by which the world may be made better. As yet the goal is so far away that we can say little definitely about how the end can be accomplished, but it is at least worth while to lay the foundation.

Now a thought which you may have in mind is that, with greater economy of effort, there will be less work for the surveyor of the future. For the answer to that question we have only to look to Europe, where techniques have been developed to meet conditions of a crowded population such as we shall certainly come to see in this country. Surveying has been intensively practiced in older countries far longer than with us, so that it might be thought that by this time everything that was possible to survey had been surveyed, and so there would be little left to do. On the contrary, Capt. Reading of the Coast and Geodetic Survey has just returned from a European tour with surprising accounts of the continued demands for the skill of surveyors, who to qualify must pass practical examinations lasting not several hours but two weeks. One of the encouraging signs is that apparently the better the product the greater the demand. It would be a great satisfaction to feel that the American surveyor also could advance his station, his usefulness, and the regard that the public has for him through devotion to the highest ideals of service.

NISTRI
OMI
ROMA

OTTICO MECCANICA ITALIANA
E RILEVAMENTI AEROFOTOGRAMMETRICI
"NISTRI" AIR SURVEY CAMERAS
AND PLOTTING INSTRUMENTS

"Nistri" Stereographometer Mod. SGG/89
Small stereoscopic plotter for quick planimetric surveys and radial graphic triangulation. By means of a special pantograph it transforms the photographic perspective into orthogonal projection at a determinate scale. The most up-to-date models are for size 24 x 24 cm. (9" x 9"), both for diapositives, paper, and film photograms rectified with the "Nistri" nadir point Photorectifier.



HEAD OFFICE: ROME (Italy) — V. Vasca Navale 81 — Tel. 599001-2-3
Cables: SAROMI—Roma
Exclusive Representation for the U.S. and Canada:
GEO-OPTIC COMPANY, INC.—170 Broadway—New York 38, N. Y.

Surveying and Mapping News

Members are requested to send in surveying and mapping news items for publication in SURVEYING AND MAPPING.—EDITOR.

CURRENT SURVEYING AND MAPPING LITERATURE

MAGAZINE ARTICLES

General Interest

THE HISTORY OF SURVEYING IN N. S. W. (New South Wales). P. W. Beaver. *The Australian Surveyor,* Vol. 14, Nos. 6 and 7, June–September 1953. (Chronological account of surveying progress in New South Wales from the earliest land and property surveys to the present time.)

FUTURAMIC PHOTOGRAMMETRY. Frederick J. Doyle. *Photogrammetric Engineering,* Vol. 19, No. 5, Dec. 1953. (A simplified statement of the problems which confront photogrammetrists.)

THE FIVE FACETS OF AERIAL PHOTOGRAPHY. Donald J. Belcher. *Photogrammetric Engineering,* Vol. 19, No. 5, Dec. 1953. (A casual discussion of what may be overlooked in the study of aerial photographs.)

SHORT RANGE PHOTOGRAMMETRY WITH MINIATURE CAMERA AND MULTIPLEX. Rudolph Burkhardt. *Photogrammetric Engineering,* Vol. 19, No. 5, Dec. 1953.

A PLAN FOR RESEARCH IN FIELDS OF AERO PHOTO INTERPRETATION. Earl J. Rogers. *Photogrammetric Engineering,* Vol. 19, No. 5, December 1953. (Discussion of the importance of a standard resolution of the photo system.)

AIRPHOTO INTERPRETATION AS AN AID IN MINERAL RECONNAISSANCE AND DEVELOPMENT. D. R. Leuder. *Photogrammetric Engineering,* Vol. 19, No. 5, Dec. 1953. (Of principal interest to geologists.)

CANADIAN PROVINCIAL BOUNDARIES (Applied title.) Group of five articles. *The Canadian Surveyor,* Vol. 12, No. 1, January 1954. (Group includes following: "Nova Scotia-New Brunswick Boundary," J. R. March; "Frontiere, Quebec-Noveau-Brunswick," Georges Cote; "Quebec-New Brunswick Boundary," Georges Cote; "Manitoba-Ontario Boundary," F. W. Beatty and E. Gauer; and "Manitoba-Saskatchewan Boundary," H. E. Beresford.)

JEAN PICARD AND HIS CIRCLE. A. Armitage. *Endeavour,* Vol. 13, No. 49, January 1954. (Brief biography of an early French scientist who was a pioneer in the use of the filar micrometer and one of the first to develop telescopic sights, which he employed in geodetic operations to determine the size of the Earth with unprecedented accuracy.)

OUTLINE OF EARLY HISTORY OF SURVEYING IN AUCKLAND PROVINCE. C. A. Lawn. *The New Zealand Surveyor,* Vol. 21, No. 1, Feb. 1954. (Interesting review of the work done before 1870.)

MAKING "ROAD MAPS" FOR THE HIGH SEAS. Staff article. *All Hands,* No. 444, February 1954. (Popular discussion of the charting and aids to navigation work of the Hydrographic Office, the Coast and Geodetic Survey, and the Coast Guard.)

AIRBORNE MAGNETIC SURVEYS. S. K. Runcorn. *Nature* (London), Vol. 173, No. 4398, February 13, 1954. (Report on a geophysical discussion held by the Royal Astronomical Society and embracing discussion of instruments used, results obtained, and other phases of airborne magnetic surveying.)

TWENTIETH ANNUAL MEETING, AMERICAN SOCIETY OF PHOTOGRAMMETRY. *Photogrammetric Engineering,* Vol. 20, No. 1, March 1954. (Most of the issue is devoted to the proceedings of the meeting and a number of papers are published in full.)

IMPRESSIONS PROFESSIONELLES ET GENERALES DES U. S. A. Dr. Hans Harry. *Schweizerische Zeitschrift fur Vermassung, Kulturtechnik und Photogrammetrie,* Vol. 52, No. 3, March 1954. (Impressions on professional surveying, mapping, and photogrammetry in general in the United States.)

SURVEYING THROUGH THE AGES. Part 1. Early Developments. Charles J. Merdinger. *The Military Engineer,* Vol. 46, No. 310, March–April 1954. (Historical discussion of the origins and development of survey practices.)

MAP INFORMATION REFERENCE SERVICE. Bill M. Woods. *Special Libraries,* Vol. 45, No. 3, March 1954. (Supplying map information is suggested as a starting point in providing map reference service in libraries which include map collections.)

THE TERM "BAYOU" IN THE UNITED STATES: A STUDY IN THE GEOGRAPHY OF PLACE NAMES. Robert C. West. *Annals of the Association of American Geographers,* Vol. 44, No. 1, March 1954. (Discusses the geographic extent of the use of the term in relation to the areal spread of a given ethnic group—in this case the French.)

THE UNITED STATES PROGRAM FOR THE INTERNATIONAL GEOPHYSICAL YEAR. Joseph Kaplan, Chairman, United States National Committee, International Geophysical Year. *News Report, National Academy of Sciences, National Research Council,* Vol. 4, No. 2, March–April 1954. (Lists the probable programs in ten fields of activity which have been selected for the IGY.)

PROCEEDINGS OF THE 1953 FLORIDA HIGHWAY AND SURVEYING CONFERENCE—NOVEMBER 19 AND 20, 1953. *Engineering Progress at the University of Florida,* Vol. 8, No. 3, March 1954, Bulletin Series No. 65. (Section II, Surveying, includes eight articles on various subjects of interest in surveying and mapping.)

UNION VS ASCE. News Item. *Engineering News-Record,* Vol. 152, No. 11, March 18, 1954. ("Debate on Engineers Union Questions Professionalism and a Management Future."

ETHICS AND THE PROFESSIONAL. N. W. Dougherty, Vice President, NSPE, and Dean of Engineering, University of Tennessee. *American Engineer,* April 1954. (Traces the ethical concepts of the learned professions to their roots in antiquity.)

ECONOMIC IMPACT OF OIL AND GAS LEASING ON PUBLIC LANDS. William A. Vogely. *Our Public Lands,* Vol. 4, No. 2, April 1954. (Discussion of part played by Bureau of Land Management in petroleum exploration using development of Williston Basin as an example.)

SUPPLEMENTAL SURVEY OF SALARIES FOR CIVIL ENGINEERING POSITIONS. Report of ASCE Committee on Salaries, 1954. *Civil Engineering,* Vol. 24, No. 4, April 1954. (Tabulated data shows, among other things, salaries in the Southern region are consistently lowest with New England and West of Mississippi areas fairly close in next to lowest position. "The Far West ranks highest in every classification.")

JEAN ROTZ AND THE MARINE CHART, 1542. E. G. R. Taylor. *The Journal of the Institute of Navigation,* Vol. 7, No. 2, April 1954. (Describes early attempts to adapt sailing charts to the variation of the compass.)

WILL THE ATCHAFALAYA CAPTURE OLD MISS? News item. *Engineering News-Record,* Vol. 152, No. 14, April 8, 1954. (Describes steadily developing threat to volume of flow in lower Mississippi River and proposals of the Corps of Engineers to avert disaster.)

ETHIOPIA—LAND OF PROMISE: OPPORTUNITIES ABOUND FOR CIVIL ENGINEERING. Perry A. Fellows. *Civil Engineering,* Vol. 24, No. 5, May 1954. (General description of the country and summary of engineering needs in connection with its future development.)

COMPETITIVE BIDDING FOR PROFESSIONAL SERVICES NOT IN THE PUBLIC INTEREST. William N. Carey. *Civil Engineering,* Vol. 24, No. 5, May 1954. (Holds that practice of competitive bidding is contrary to professional code and quotes court decisions to show it not required by law.)

THE U. S. GEOLOGICAL SURVEY; 75 YEARS OF SERVICE TO THE NATION, 1879–1954. John C. Rabbitt and Mary C. Rabbitt. *Science,* Vol. 119, No. 3100, May 28, 1954. (A succinct, well written history of the Survey and the circumstances leading to its establishment.)

THE COLORADO PLATEAU PROVINCE AS A FIELD FOR GEOLOGICAL SURVEY STUDY. Mary C. Rabbitt. *The Scientific Monthly,* Vol. 78, No. 6, June 1954. (A very interesting and well illustrated discussion of the multiple activities, including topographic mapping, of the Geological Survey in the Colorado Plateau area.)

BLUEPRINT FOR AUTOBAHN, U. S. A. Paul F. Griffin. *The Scientific Monthly,* Vol. 78, No. 6, June 1954. (The writer points to the ominous lag in highway facilities on a national basis and urges planning for broad transcontinental freeways to take care of ever-increasing civil needs and possible military exigencies.)

HAMMERFEST MERIDIAN MONUMENT. Trevor Lloyd. *The Geographical Review,* Vol. 44, No. 3, July 1954. (Monument marking northern terminus of arc recalls pioneer geodetic survey originating in Russia in 1816, extending from Izmail on the Danube River through Russia, Sweden, and Norway, and terminating in 1852 at Fulgenes, Norway.)

Cartography

SAVING TIME AND MONEY IN MAP REPRODUCTION. Paul J. Dube. *Civil Engineering,* Vol. 23, No. 9, September 1953. (Cartographic Engineer, Nevada Department of Highways, describes method of reproduction employ-

ing Autopositive film to eliminate two steps of time-consuming and expensive wet processing.)

THE EFFECTIVE USE OF CARTOGRAPHIC AIDS IN ECONOMIC RESEARCH. Jerry B. Culver and Arlin D. Fentem. *Land Economics,* Vol. 29, No. 4, November 1953.

LA NOUVELLE CARTE DE BELGIQUE AU 50,000e TYPE R (RAPIDE) De L'INSTITUTE GEOGRAPHIQUE MILITAIRE. J. Hanot. *Bulletin de la Societe Royale Belge de Geographie,* 77th year, fasc. III–IV, December 1953. (A discussion of methods used for rapid revision of the Belgian 1:50,000 series to bring essential details up to date. Sample of one sheet in the series, folded, in jacket at end of Bulletin.)

LITHOGRAPHY ON SHIPBOARD. C. L. "Kip" Miller. *The National Lithographer,* Vol. 61, No. 3, March 1954. (Tells of the problems of operating lithographic equipment at sea and describes devices adopted for overcoming various difficulties.)

SMALL-SCALE CONTINENTAL LANDFORM MAPS. Edwin H. Hammond. *Annals of the Association of American Geographers,* Vol. 44, No. 1, March 1954. (Embodies a proposal for showing terrain configuration on small-scale maps by a more rational selection of symbols.)

ECONOMIC ASPECTS OF NAUTICAL CHARTING. F. C. G. Smith. *The Canadian Surveyor,* Vol. 12, No. 2, April 1954. (Describes contribution of hydrographic surveys to commerce in general.)

THE CHOICE OF MAP PROJECTIONS. W. G. V. Balchin. *Empire Survey Review,* Vol. 12, No. 92, April 1954. (Discussion of the subject from a practical point of view.)

MAP BUSINESS BOOMS FOR COLORADO. News item. *Engineering News-Record,* Vol. 152, No. 23, June 10, 1954. (Tells of increased demand for county highway maps and briefly describes method of production and distribution.)

A BASE MAP FOR THE EAST BAY. (Technical Report No. 17, for presentation to and the approval of the East Bay Council on Surveying and Mapping, Oakland, Calif. Processed text and symbols.)

NEW TECHNIQUES AND DEVELOPMENTS IN OFFSET PLATEMAKING. Harry Mueller. *Modern Lithography,* Vol. 22, No. 7, July 1954. (Review of modern processes.)

Control Surveys

PRACTICAL EXAMPLE OF ADJUSTMENT OF AERIAL TRIANGULATION BY THE METHOD OF LEAST SQUARES. R. Roelofs. *Photogrammetria,* Vol. 10, No. 1, 1953–1954. (Mathematical discussion using formulae and tables.)

ADJUSTMENT OF AERIAL TRIANGULATION. A. J. van der Weele. *Photogrammetria,* Vol. 10, No. 2, 1953–54. (Mathematical discussion of methods for further development and simplification of the Roelofs formulae.)

PHOTOGRAMMETRY. Summary of lectures given before the Discussion Group on Photogrammetry of the Melbourn Division by various speakers. *The Australian Surveyor,* Vol. 14, No. 8, December 1953. (Titles include: Development of Photogrammetry in Australia, Period up to June 1949; Practical Requirements of Map Users; Williamson-Ross Multiplex Mapping Equipment; Stereopsis and its Relation to Photogrammetry; Preparation of Geological and Topographical Maps; Training in Photogrammetry Including Elementary Interpretation; and Aerial Photography.)

THE USE OF STOKES'S FORMULA IN THE ADJUSTMENT OF SURVEYS. (In English). Sir Harold Jeffreys. *Bulletin Geodesique,* New Series, No. 30, December 1, 1953. (Holds that use of Stokes' formula to adjust survey data in present circumstances is undesirable unless general agreement is first obtained on the distribution of gravity to be adopted as a basis for the computation.)

PHOTOGRAMMETRIC MAPPING IN SOUTH AFRICA. F. W. Marsh and W. C. Watson. *Empire Survey Review,* Vol. 12, No. 91, January 1954. (Discusses use by Trigonometrical Survey of South Africa of Wild photogrammetric equipment in compiling 1:18,000 scale topographical maps from 1:30,000 scale photographs.)

TWO SHORT METHODS OF COMPUTATION OF THE THREE-POINT PROBLEM. L. F. Gregerson. *The Canadian Surveyor,* Vol. 12, No. 1, January 1954. (Further mathematical solutions of the well-known problem.)

THE ESTABLISHMENT OF A GRID SYSTEM OF SURVEY AND PLAN CONTROL IN A MODERN URBAN AREA. Wm. Harvey Hall. *The Canadian Surveyor,* Vol. 12, No. 1, January 1954. (Points out increasing need for survey control and coordination in urban areas and recommends plan for control surveys in city of Kitchener, Ontario.)

RANGE FINDING WITH A THEODOLITE AND SHORT BASE. S. E. Evans. *Empire Survey Review,* Vol. 12, No. 92, April 1954. (Describes practical field method for establishing provisional points, miles apart, with a minimum of delay and with reasonable accuracy.)

RADAR CONTROLLED AIR SURVEY PHOTOGRAPHIC OPERATIONS IN AFRICA, 1946–1952. Major S. Hellings. *Empire Survey Review,* Vol. 12, No. 92, April 1954. (First installment of general description of or-

ganization and operations of the Directorate of Colonial Surveys.)

CANADIAN SHORAN EFFORT, 1949–1953. J. E. R. Ross, Dominion Geodesist. *Empire Survey Review*, Vol. 12, No. 92, April 1954. (Discussion of methods and equipment used in extensive program of electronic trilateration.)

MAGNETIC DECLINATION. J. Layton Reid. *The Canadian Surveyor*, Vol. 12, No. 2, April 1954. (Discusses methods of determining astronomic azimuth by compass shadow.)

THE INTERNATIONAL METRE. R. H. Field. *The Canadian Surveyor*, Vol. 12, No. 2, April 1954. (History of the establishment and adoption of the standard measure.)

THE DEVELOPMENT OF PHOTOGRAMMETRY IN CANADIAN FORESTRY. F. T. Jenkins. *The Canadian Surveyor*, Vol. 12, No. 2, April 1954. (Discussion of the evolution of aerial photography in connection with the development of one of Canada's greatest natural resources.)

SECOND ORDER SURVEY IN SAUDI ARABIA. Thomas C. Oftelie. *The Military Engineer*, Vol. 46, No. 311, May–June 1954. (Account of a project undertaken by Aero Service Corporation to develop basic primary vertical control for the preparation of maps and correlation of exploration drilling and geological information in difficult, unexplored area.)

SPECIAL METHODS AND EQUIPMENT. (Technical Report No. 15, submitted for consideration and approval of the Technical Committee of the East Bay Council on Surveying and Mapping, Oakland, Calif. Processed text and illustrations of equipment used by city of Oakland in control surveys.)

SECONDARY MONUMENTS. (Technical Report No. 19, for presentation to and the approval of the East Bay Council on Surveying and Mapping, Oakland, Calif. Processed text and illustrations.)

Education

SURVEYING INSTRUCTION AT THE UNIVERSITY. A. Stephenson. *Empire Survey Review*, Vol. 12, No. 91, January 1954. (Brief description of methods adopted in the Civil Engineering Department of the Imperial College of Science and Technology.)

UNIVERSITY TRAINING FOR SURVEYORS. Editorial. *The New Zealand Surveyor*, Vol. 21, No. 1, February 1954. (Comment on the deficiencies in surveying education in New Zealand.)

INADEQUATE PRE-COLLEGE TRAINING IMPERILS NATION'S FUTURE. Major-General S. D. Sturgis, Jr. *Civil Engineering*, Vol. 24, No. 5, May 1954, (Warns of growing lack of interest by secondary school students and the vital need for stimulating that interest.)

PROF. R. B. WILEY TO LEAVE PURDUE ENGINEERING SCHOOL. News item. *The Engineering News-Record*, Vol. 152, No. 23, June 10, 1954. (Announces retirement of prominent engineering educator and tells something about his successor, Prof. Kenneth B. Woods.)

Topography

SOME PROBLEMS OF ALLUVIAL TERRACE MAPPING. John C. Frye and Alvin R. Leonard. *American Journal of Science*, Vol. 252, No. 4, April 1954. (Of interest primarily to geologists.)

Instruments

PRINCIPLES OF DESIGN AND THE APPLICATIONS OF THE MM101 SURVEYING CAMERA. Everett L. Merritt. *Photogrammetric Engineering*, Vol. 19, No. 5, Dec. 1953. (Technical description of a highly complicated camera used in photogrammetric mapping.)

DESIGN CONSIDERATIONS FOR AN INTEGRAL GONIOMETRIC CAMERA. E. L. Merritt. *Photographic Engineering*, Vol. 5, No. 1, January 1954. (Describes a portable, multipurpose, tripod-mounted goniometer type of instrument designed to obtain astronomic position data, astronomic azimuth data, and triangulation data, quickly, under the restricted circumstances of surveying in areas that are remote or inaccessible by conventional means.)

THE AERIAL ESTIMATOR. No author given. *The Canadian Surveyor*, Vol. 12, No. 1, January 1954. (Brief description of an airborne instrument used to estimate timber areas, etc.)

THE R. W. PAUL INSTRUMENT FUND. Author unnamed. *Nature* (London), Vol. 173, No. 4398, February 13, 1954. (Report on the operation, with descriptions of some end results, of the fund set up in 1945 to provide grants to aid research and development of a wide range of scientific instruments.)

ELECTRO-OPTICAL IMAGE PROCESSING. Information item. *National Bureau of Standards Technical News Bulletin*, Vol. 38, No. 5, May 1954. (Describes system that clarifies blurred photos and produces line drawings from halftone photographs. May have future application to photogrammetry.)

SURVEYING THROUGH THE AGES. Part II. Development of Instruments. Charles J. Merdinger. *The Military Engineer*, Vol. 46, No. 311, May–June 1954. (Historical and descriptive account of evolution of various surveying instruments. *See* entry under "General Interest" for first article in this series.)

Property Surveys

SOME ASPECTS ON THE PHOTOGRAMMETRY OF THE SWEDISH LAND SURVEY. Sven G. Moller. *Photogrammetria*, Vol. 10, No. 1, 1953–1954. (In addition to describing the recent photogrammetric work of this old established survey, an interesting summary of its organization, mission, and general activity is provided.)

PHOTOGRAMMETRY FOR CADASTRAL SURVEY. W. Schermerhorn and G. F. Witt. *Photogrammetria*, Vol. 10, No. 2, 1953–54. (Application of photogrammetry to various systems of cadastral surveys with review of methods and conditions in various countries of Europe.)

SURVEYS FOR RURAL TRANSMISSION LINES. E. C. Pearce. *The Australian Surveyor*, Vol. 14, Nos. 6 and 7, June–September 1953. (Deals with method and procedure employed in this special type of survey.)

THE EARLY DETAIL SURVEYS OF SYDNEY. P. W. Beaver. *The Australian Surveyor*, Vol. 14, No. 8, December 1953. (Detail surveys for public works development, etc., based on precise triangulation.)

THE ACCURACY OF SOIL MAPS PREPARED BY VARIOUS METHODS THAT USE AERIAL PHOTOGRAPH INTERPRETATION. James A. Pomerining and Marlin G. Cline, *Photogrammetric Engineering*, Vol. 19, No. 5, Dec. 1953. (Using examples of two surveys this article evaluates the use of photogrammetric methods in soil surveying.)

PHOTOGRAMMETRY IN AN ENGINEERING FIRM. Lewis A. Dickerson. *Photogrammetric Engineering*, Vol. 19, No. 5, Dec. 1953. (Describes benefits derived from photogrammetric methods used in a commercial field.)

FACTS ABOUT CADASTRAL SURVEYS. Earl G. Harrington. *Our Public Lands*, Vol. 4, No. 2, April 1954. (Brief, general discussion of the rectangular system of surveys of public lands.)

BOOKS AND PAMPHLETS

A SYSTEM OF MORPHOMETRY. F. C. W. Olsen. Contribution No. 21, The Oceanographic Institute, Florida State University. N. D. 20 pp., Mimeographed.

ANUARIO DEL INSTITUTO GEOGRAFICO MILITAR (CHILE). No. 6, 1946–1950. 148 pp., tables, maps, diagrams. (Reports on activities of the Military Geographic Institute including departments of control and statistics, geodesy, topography, land surveys, cartography, etc.)

CIVIL ENGINEERING REFERENCE BOOK. E. H. Probst and J. Comrie, editors. *Butterworth Scientific Publications*, London, 1951. 1,577 pp., tables, diagrams.

SOIL CONSERVATION DISTRICTS IN ACTION. Robert W. Parks. *Iowa State College Press*, Ames, 1952. 242 pp., illus., charts.

ELEMENTS OF ASTRONOMY FOR SURVEYORS. Robert W. Chapman. Edition 5, revised and enlarged by J. B. Mackie. *C. Griffin*, London, 1953. 245 pp.

GUIDE TO ALASKA AND THE YUKON; THE AUTHENTIC HANDBOOK OF THE FAR NORTH. Louis Jacobin. 7th edition. *Guide to Alaska Co.*, Juneau, 1953. 248 pp.

ROUTE LOCATION AND SURVEYING. Thomas F. Hickerson. *McGraw-Hill Book Co., Inc.*, 330 W. 42nd St., New York 36, N. Y. Third edition, 1953. 543 pp. $6.00.

GEOGRAPHY FROM THE AIR. F. Walker. *E. P. Dutton and Company, Inc.*, New York, 1953. P. vii and 111. 96 plates. (Introduction to the correlation of geographical data with the air photographs from which maps are finally constructed.)

THE RURAL-URBAN FRINGE: A STUDY OF ADJUSTMENT TO RESIDENCE LOCATION. Walter T. Martin. *University of Oregon*, Eugene, 1953. 109 pp., maps, tables. (University of Oregon Monographs; Studies in Sociology No. 1.)

UNITED STATES COAST PILOT 3; ATLANTIC COAST, SANDY HOOK TO CAPE HENRY. U. S. Coast and Geodetic Survey, *Government Printing Office*, 1953. $2.50. (First of the series of 10 United States Coast Pilots issued under the new numbering system. Distributed by sales agents, district offices, and the Washington office of the USC&GS.)

HISTORY AND TRADITIONS OF THE CORPS OF ENGINEERS. U. S. Engineer School, Fort Belvoir, Va., 1953. 108 pp. (ST 25-1).

A MANUAL OF ENGINEERING DRAWING FOR STUDENTS AND DRAFTSMEN. Thomas E. French and Charles J. Vierck. *McGraw-Hill Book Company, Inc.*, 330 W. 42nd St., New York 36, N. Y., eighth edition, 1953. 715 pp. $8.00.

ENGINEERS AS WRITERS. Walter J. Miller and Leo E. A. Saidla, editors. *D. Van Nostrand Company, Inc.*, 250 4th Ave., New York 3, N. Y. 1953. 340 pp. $4.25. (A text for instruction in technical composition.)

REVISTA CARTOGRAFICA. Instituto Panamericano de Geografia e Historia. Comision de Cartografia. Ano 2, No. 2, Buenos Aires,

Republica Argentina, 1953. 328 pp., maps, color plates. (Issue contains 14 articles and 14 monographs published variously in Spanish, Portuguese, and English on cartography, surveying, and related topics.)

AERIAL METHODS IN MICROWAVE SURVEY. Reprint from Part 5, Convention Record, Institute of Radio Engineers, 1954 National Convention. 19 pp., processed, illus.

WORLD CARTOGRAPHY, VOLUME II. United Nations, Dept. of Social Affairs, New York. English edition, 1954. $1.25. (This volume includes study entitled "Map Reproduction in the United States of America" by W. S. Dix.)

INTRODUCTION TO GEOMETRICAL AND PHYSICAL OPTICS. Joseph Morgan. *McGraw-Hill Book Co., Inc.*, New York. $6.50. 450 pp. (Possible interest to Instruments Division.)

LOST CONTINENTS; THE ATLANTIS THEME IN HISTORY, SCIENCE, AND LITERATURE. Lyon Sprague De Camp. *Gnome Press*, New York, 1954. 362 pp., maps.

STATISTICAL THEORY OF EXTREME VALUES AND SOME PRACTICAL APPLICATIONS. E. J. Gumbel. National Bureau of Standards Applied Mathematics Series No. 33. *Government Printing Office*, Washington 25, D. C., 1954. 51 pp., 38 figs., 10 tables. 40 cents.

MAP COLLECTIONS IN THE UNITED STATES AND CANADA; A DIRECTORY. Marie Cleckner Goodman. *Special Libraries Association*, 31 E. 10th St., New York 3, N. Y., 1954. 170 pp., distribution map. $3.00.

A GUIDE TO HISTORICAL CARTOGRAPHY. Compiled by Walter W. Ristow and Clara E. LeGear. *The Library of Congress*, Reference Department, Map Division, Washington, 1954. Processed, ii and 14 pp., index.

A NEW SOLUTION FOR THE THREE-POINT PROBLEM. State of Maryland, Bureau of Control Surveys and Maps, Publication No. 1, 2nd Reprint, June 1954. 308 Tower Building, Baltimore 2, Md. Processed, 10 pp., diagrams; essentials of procedure and formulae printed on 7½- by 10½-inch card inserted in back of pamphlet.

ANALYTICS AS A SUBSTITUTE FOR TRIANGULATION. State of Maryland, Bureau of Control Surveys and Maps, Publication No. 3, June 1954. 308 Tower Building, Baltimore 2, Md. Processed, iv and 5 pp., tables and diagrams.

—LYMAN D. LYNN

DISTINCTIVE RECENT MAPS

For the reader's convenience, the addresses of publishers and prices of maps are given where this information is available.—EDITOR

After a lapse of some 14 years, the Bureau of Land Management has issued a new edition of the map of *United States including territories and insular possessions showing the extent of public surveys of national parks, national forests, Indian reservations, national wildlife refuges, and reclamation projects.* Although it carries a 1953 date, the map was not released until April 1954. It is printed on two large sheets which when joined form a wall map measuring approximately 60 by 85 inches. The scale is 37 miles to the inch. Copies at four dollars each may be ordered from the Superintendent of Documents.

United States Water Resource Development maps the flood control, irrigation, navigation, and power development activities of the Department of the Army, Department of the Interior, and the Tennessee Valley Authority. It was compiled and printed by the U. S. Geological Survey, and may be ordered from the Superintendent of Documents at $2.25 per copy. Published in October 1953, at the scale of 1:2,500,000, the map shows dams, navigation locks, reservoirs and aqueducts, irrigation projects, navigation and flood-protection projects, and hydroelectric and thermal power systems. This large, colorful map is printed on two sheets, each measuring 48 by 39 inches. There are several insets of Alaska, the Hawaiian Islands, Puerto Rico, and the Virgin Islands, and major drainage areas of the United States.

Airline Map of the United States, published in 1953 by the Official Airline Guide, 139 N. Clark St., Chicago 2, Ill., presents the major air routes and cities served as of December 1, 1952. Initials along the routes, indicating the respective airlines, are keyed to a list of the companies at the lower section of the map. The scale is 1:5,400,000 and the dimensions 24½ by 35½ inches.

Real Estate Market Price Indicators, 1954, are presented by Roy Wenzlick and Company, 706 Chestnut St., St. Louis 1, Mo. The sheet, measuring 24 by 39 inches, includes six graphs and one map. The latter, 10½ by 16½ inches, shows *Cash Income Per Family* in the United States, by counties. Eight classes of average income are shown by contrasting colors. The graphs present "Business Activity," "Real Estate Activity," "Building Cost Data," "Variations in Selling Prices of Single-Family Residences," "Mortgage Activity and Interest Rates," and "Trends in Farm Land Values."

Donn Layne copyrighted in 1954 a revised version of his *United States Election Result Map for recording 1954 Senatorial, Congressional and Gubernatorial Contests.* Publisher is University Graph Company, 2824 West 7th St., Los Angeles 5, Calif. "This map graphically sets forth all our Congressional Districts, gives the result, by States, of the last general election (1952) and facilitates the recording of political changes due to the 1954 November elections." No scale is given for the map which measures 18½ by 28 inches.

A *Flow Map Showing Movement of Lake Superior Iron Ores and of Eastern and Imported Ores With Locations of Consuming Furnaces for the Year 1951,* was compiled and published in 1953 by the Lake Superior Iron Ore Association, 1400 Hanna Building, Cleveland 15, Ohio. Tables on the margins of the map give "Location of Consuming Furnaces and Names of Operating Companies," and "1951 Lake Superior Mine Shipments—By Ranges." The map is at the Scale of 1:2,700,000 and measures 22 by 30 inches.

The Alabama Department of Agriculture and Industries published in 1953 a *Soil Map* and an *Elevations* map of the State of Alabama. Both are at the approximate scale of 1:1,000,000 and measure 20½ by 13 inches. The "Elevations" map shows feet above sea level, by means of eight color groupings ranging from "0–100" feet to "1500." Sources of data are the U. S. Coast and Geodetic Survey, and various railroad companies. The Soil Map was compiled by consolidating the soil classifications, shown on the county soil maps, "into Soil Groups so that each would contain soils that have similar physical characteristics, namely, slope, color, texture, drainage, etc." Thirty-six soil groups are mapped in color and described in a legend printed on the verso of the map sheet.

Arts of Alabama and Art Resources is the title of a colonial map published in 1954 by the Birmingham Branch of the American Association of University Women, with the cooperation of Arts Branch Chairmen of the Association in other parts of the State. It was designed by Mary Eleanor Budges with layout by Adele de la Barre Robinson. The map measures 19½ by 15 inches. No scale is given.

Land Areas of Kentucky and their Potential for Use classifies the State into use-suitability regions. The classification used "is a generalized interpretation of the soil resources in terms of the most intensive uses feasible for sustained production." The map was prepared and published in 1953 by the Agricultural and Development Board of Kentucky, with the cooperation of the Soil Conservation Service, U. S. Department of Agriculture, and the Agricultural Experiment Station, University of Kentucky. The scale is approximately 12 miles to the inch and the dimensions 17 by 37 inches. Descriptive text on the physiography, climate, soils, geology, and "economics and trends of agriculture," as well as views and small maps fill the verso of the map sheet.

A new edition of the *Oil and Gas Map of Louisiana* was published, in August 1953, by the [Louisiana] Department of Conservation. The map was compiled and drafted by G. O. Coignet for the Louisiana Geological Survey, and printed by A. Hoen & Company of Baltimore, Md. Oil and gas producing areas, depleted fields, pipelines, refineries, and other processing plants are shown. Pipeline operating companies are listed in the legend and identified on the map by initials. The map measures 41 by 41 inches and is at the scale of 1:500,000.

A *Mineral Industry Map of Ohio* was published in 1953 by the Division of Geological Survey, [Ohio] Department of Natural Resources, with the cooperation of other agencies. At the scale of 1:500,000, the map shows deposits of coal, limestone or dolomite, salt, gypsum, sandstone, sand and gravel, and shale or clay. Numbers on the map are keyed to the numerical directories in the annual coal and non-metallic mineral report of the Division of Mines for the year 1952. The map measures 33½ by 30½ inches.

Northwest Territories Transportation and Communications is the title of a black and white map published in 1953 by the [Canadian] Department of Resources and Development. It was compiled and drawn by the Geographical Branch, Department of Mines and Technical Surveys. The map shows summer water routes, commercial air routes, highways, railways, radio stations, meteorological reporting stations, post offices, and the northernmost limit of trees. The size is 15 by 19½ inches and the scale 1:10,000,000.

The lure of buried and sunken wealth is a constant attraction to treasure seekers and artist-cartographers. Latest in a long line of pictorial treasure maps is *Ye Chart of True Locations of Sunken Vessels, honest and Pyrate, containing Wealth in Silver, Gold, and Jewels being lost in the Waters and Passages of the Spanish Main, Florida, and the West Indies, and Including that Buried Treasure of fact and history, that in all is Estimated to Exceed 400 Million Dollars.* This black and white map, decorated with sailing ships and pirates, was copyrighted in 1954 by Dale M. Titler. No scale is indicated on the map which measures 15 by 22 inches.

An *Economic map of Europe,* at the scale of 1:3,250,000, has been compiled by Prof. W. William Olsson of the Stockholm School of Eco-

nomics, and published in 1953 by the Generalstabens Litografiska Anstalt (Stockholm). The map, printed on two sheets each approximately 50 by 33 inches, is drawn on Albers' equal area projection. Economic life, as depicted on the map, is defined as "the interplay between men and the areas and localities that they exploit. The system of signs represent area, lines indicate communications, and volume symbols refer to human beings. Land and sea are indicated by surface colours, and the land areas are designated according to the intensity of the exploitation." Enlarged inset maps show the heavy industrial concentrations of central Britain and the lower Rhine region. A twelve-page explanatory booklet, including an outline map of Europe showing administrative boundaries, accompanies the map.

Generating plants and substations of various types, existing, under construction, or planned, and the present and projected power network of Europe (exclusive of U.S.S.R.) are shown on a map entitled *Réseaux de Transport d'Énergie Électrique d'Europe*. It was published in August 1953 (5th edition) by l'Union Internationale des Producteurs et Distributeurs d'Energie Electrique, 12, Place des Etats-Unis, Paris. The map is at the scale of 1:2,000,000 and is printed on four sheets, each 35 by 34 inches.

Internal administrative boundaries as of July 1953 are delimited on the *Politische Karte der Republik Österreich*, published by the Bundesamt für Eich- und Vermessungswesen (Landesaufnahme) in Vienna, Austria. Towns and cities, transportation routes, and other cultural features are also shown on the map which is at the scale of 1:500,000. Dimensions, within the neat line, are 29½ by 46½ inches.

The distribution of population in Austria, as of June 1, 1951, is presented on a dot map published in 1953 by Österreichischen Statistischen Zentralamt, Wien. It carries the title *Die Räumliche Verteilung der Bevölkerung in Osterreich*. Boundaries of primary and secondary administrative districts are shown. The map is approximately 24 by 46 inches in size.

Iles Britanniques Carte Economique is No. 61 in the series of maps prepared by the Direction de la Documentation, Secrétariat Général du Gouvernement [France]. At the scale of 1:1,500,000, it shows, by symbols and colors, various aspects of the agricultural, extractive, industrial, and commercial economy of the British Isles. There are enlarged insets of the center of London and the Liverpool-Manchester region.

Reseaux de Transport d'Energie Electrique de France, presents the power distribution network of France. It was compiled by L'Electricité de France, and published in January 1954 by Rambault et Guiot of Paris. The map is available in two sizes at the respective scales of 1:1,250,000 (32 by 37 inches), and 1:3,000,000 (13 by 16 inches).

The Norges Geologiske Underskelse published recently two geological maps of Norway. *Berggrunnskart over Norge*, issued in 1953, was compiled by O. Holtedahl and J. A. Dons. At the scale of 1:1,000,000, it shows the major geological formations of Norway. *Glacialgeologisk Kart over Norge*, by O. Holtedahl and B. G. Anderson, presents the glacial geology of the country at the same scale. It was published in 1952. Both maps measure 45 by 29½ inches.

Forest projects, activities, headquarters, and experiment stations are located on a map of *Portugal* published recently by the Direction General of the Forest Service and Inland Waters, [Portuguese] Ministry of Economy. The map measures 26 by 18 inches and is at the scale of 1:1,000,000.

Internal and external administrative boundaries of Algeria are presented on the map entitled *Algérie Limites Administratives*. It was published in November 1953, at the scale of 1:6,000,000, by the Gouvernement Général de l'Algérie, and printed by Imprimerie Baconnier, Alger. Cartography is by H. Thomas. Dimensions of the map are 15½ by 19 inches.

A contour and color gradient relief map of *Afghanistan* was published in January 1954 by the United Nations. It is at the scale of 1:2,200,000 and measures 19½ by 21 inches. International and provincial boundaries, provincial capitals, cities, airfields, railways, roads, and tracks are limited. Distances in kilometres between cities are shown along the main roads.

India and Adjacent Countries are presented at the scale of 1:2,534,400 on a map published in 1952 by the Surveyor General of India. It is printed on four sheets each measuring 30 by 33 inches. The main map distinguishes the several types of administrative states and delimits political boundaries. Roads and railroads are also classified. Small-scale inset maps show geology and principal minerals, density of population, principal industries, orographical features, isothermal lines, and average rainfall.

The Geological Survey of Japan published several new maps in 1953. The *Geological Map of Japan*, at the scale of 1:3,000,000, measures 26½ by 21½ inches. The complex geological pattern of Japan is portrayed by 17 contrasting color symbols. The map showing *Coal Fields of Japan* is at the scale of 1:2,000,000. Bordering the main map are enlarged insets of several of the larger fields, and production, use, and im-

port graphs. The map sheet measures 38 by 30 inches.

The *Compiled Geological Map of Kanto Region* shows the area around Tokyo and Tokyo Bay at the scale of 1:400,000. Names of towns and cities and symbols are given in both English and Japanese. At the bottom of the sheet are six tectonic sections. The map measures 39½ by 25½ inches.

A hypsometric relief map of *Sarawak and Brunei* (British North Borneo), was compiled and drawn by the Land and Survey Department, Sarawak, March 1953. It was reproduced and printed by the Survey Department, Federation of Malaya, in December 1953. The map, which is at the scale of 1:1,000,000, measures approximately 27 by 29 inches.

—WALTER W. RISTOW

U. S. Government Films

NESTLED in a film catalog entitled "3434 U. S. Government Films," are over a dozen titles of 16-millimeter motion-picture films and about half as many film strips that should be of particular interest to readers of SURVEYING AND MAPPING.

The title above applies to Bulletin 1951, No. 21, Reprint, 1954, a catalog recently published to acquaint the public with the latest government film material available on a wide range of subjects. Alphabetically arranged by title, the films are coded to indicate readily the source from which the film may be borrowed. The films listed are those which belong to the Executive, Judicial, and Legislative Branches of the Federal government; not included are films which are owned by such agencies as the American Red Cross, United Nations, and State governmental agencies.

Some of the subjects treated are aerial map reading, aerial photography, leveling for topographic mapping, multiplex mapping, photos and photomaps, topographic mapping by photogrammetric methods, and transit traverse. Other fields of endeavor, from cooking to psychiatry, are covered in this valuable list.

The catalog is sold by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 70 cents.

—T. A. HUGHES

A New Optical Device for Approximate Angle Measurement

THE Möller clinometer, recently placed on the American market by the Geo-Optic Company of New York, is a handy device for quick measurement of approximate vertical or horizontal angles or rates of grade.

Based on the principle of ocular projection of a virtual image, the instrument is held by hand, suspended pendulously from a swivel-ring, in front of the eye. Through a unique arrangement of a lens combined with a transparent graduated scale, a scale of degrees and half-degrees of vertical angle is seemingly projected against the observer's field of vision in such a manner that the vertical angle to any visible object can be easily read. Since the instrument is pendulous, it is automatically established in a vertical position and no settings or bubble readings are required. Measurements of approximately ten-minute precision should be possible. A second similar scale in the instrument permits readings of rates of grade to about one-half of one percent.

By holding the instrument in a horizontal position, it is possible to read horizonal angles, but, due to the lack of a fixed reference, as for vertical angles, it must be held very steadily in the hand. As it is not possible to see the entire angular scale from one position of the eye, slight shifting of the eye position is required, which will limit accuracy to about one degree.

The instrument is small and convenient to carry in the field. When not in use it folds to approximately 1 inch by 4¼ inches by ½ inch and weighs only 5 ounces in its leather carrying case.

—RALPH MOORE BERRY

Books in Review

PORTFOLIO OF UNITED STATES CENSUS MAPS 1950. U. S. Department of Commerce, Bureau of the Census. Prepared under the supervision of Clarence E. Batschelet, Chief, Geography Division. Washington, *U. S. Government Printing Office,* 1953. 28 pages. $4.00.

Census statistics, to most of us, are rather dull and incomprehensible. When they are analyzed by specialists, and their essential facts are presented graphically or cartographically, however, many interesting and useful distributions and relationships are revealed.

Many of the publications of the 1950 Censuses of Population and Agriculture are enhanced by the addition of such graphical illustrations. A selection of statistical maps and graphs, included in these publications, has been brought together in *Portfolio of United States Census Maps 1950.* The twelve pages devoted to population include twenty maps, which present various aspects of urban and rural population distribution and composition. Changes between 1940 and 1950, for various categories, are shown.

Agricultural data, including land use, crop and animal distribution, land tenure, economic productivity, farm machinery and equipment, etc., are presented on seventy maps.

Pockets, on the inside front and back covers, hold the large map of *United States, Population Distribution, Urban and Rural: 1950,* and *United States County Outline Map: 1950.*

The *Portfolio,* compiled primarily for use by business, government agencies, and schools, was prepared by the staff of the Geography Division, under the supervision of its Chief, Clarence E. Batschelet. Reprints of the maps and graphs in the *Portfolio* may be obtained at cost from the Director, Bureau of the Census.

WALTER W. RISTOW
The Library of Congress

GRUNDZÜGE DER AUSGLEICHUNGSRECHNUNG: NACH DER METHODE DER KLEINSTEN QUADRATE NEBST ANWENDUNG IN DER GEODÄSIE (Fundamentals of the computation of adjustments according to the method of least squares, with applications to geodesy). Walter Grossmann. *Springer-Verlag,* Berlin. 261 pages. 19.80 German marks.

This is a text, at the level of a college upperclassman or a junior professional mathematician, on the theory and practice of the method of least squares. The aim of the book throughout is to show how to do an adjustment rather than to elaborate the theory. Derivations are restricted to giving what Maxwell called the "go" of the proof; that is, the turning point of the demonstration, with most of the formalisms left out. The derivations nevertheless give the reader the feeling that he has understood the points upon which the proof rests, so that he can avoid misapplying the result.

After a general introduction on the theory of errors, there are three chapters which form the body of the text, corresponding to the three main types of adjustment: first, the formation of simple averages, where one quantity only is involved and it has been measured directly; second, the adjustment of observation equations; and, third, the adjustment of condition equations. The first of these is very short, of course; the meat is in the latter two chapters.

The discussion of the method of solution of the normal equations revolves around the Gauss method. Other techniques which have been suggested for punched-card machines are not described. The checks on the solution are fully described, and the problem of obtaining the mean errors of the unknowns is fully discussed. At the end of the descriptions of the methods of adjustment by observation equations and by condition equations, there is a brief summary of the steps to be taken. This is especially welcome to a computer who is already familiar with a part of the process and wishes to find out how to do the rest. Anyone who has tried to get out of Jordan the most economical method of obtaining the mean errors will appreciate Grossmann's discussion of this point, and especially his clear exposition of the relation between weights and mean errors.

The text includes the Boltz Development Method for handling large numbers of simultaneous linear equations; it does not include the Boltz Substitution Method, which is somewhat newer and more general. Both of these methods are intended to permit a large group of equations to be broken into two or more parts, which are solved separately and then joined together.

The Appendix contains sections on the iteration methods of solving systems of equations; on fitting curves by power series (including a canned least-squares solution for the first few powers); on Fourier Analysis; and on the mean error of the measure of precision. These topics, which lead on toward the new American and British developments in communication theory are very brief and elementary.

The exposition is remarkably clear and effective. There are many examples, worked out in great detail and constituting almost half the text. They cover almost all the problems which arise in practice, either in surveying or in geodesy.

The printing, while far superior to similar French or Italian texts, is not quite as good as Springer's printing before the war; nor is the paper quite as good.

For anyone who can read German, and who has a requirement for performing least-squares solutions, especially in geodetic problems, this is an excellent guide and reference book.

JOHN A. O'KEEFE

Army Map Service

THE PACIFIC NORTHWEST. (Second Edition.) Edited by Otis W. Freeman and Howard H. Martin. *John Wiley & Sons, Inc.,* New York. 1954. 544 pages including maps and illustrations. $8.50.

Because of the size and geographical complexity of the United States, a detailed treatment of the whole country in one volume is virtually impossible. Consequently, those who seek either detailed information on parts of the Pacific Northwest or an over-all understanding of the region will find this book, edited by Freeman and Martin, a unique and useful compilation, including 51 maps and 25 picture plates.

Contributions have been included from 30 specialists representing 12 institutions of higher learning, 2 Federal bureaus, a public school system, a commercial mapping firm, and a lumbermen's association. The scope is unusually comprehensive including the work of specialists in anthropology, climatology, geology, history, and various fields of natural resources as well as that of many professional geographers.

The 27 chapters are divided into five groups dealing respectively with: (1) changing human adjustments from primitive Indian life to modern economic developments; (2) the physical environment, with special stress on relief, climatology, and resources; (3) the exploitation and conservation of resources, including soils, minerals, fisheries, grasslands, forest, water, wild life, and recreation areas; (4) agriculture, including live stock, dairying, and poultry, in addition to cereals, fruits, vegetables, and forage crops; and (5) industry, commerce, and urban developments.

This 1954 revision of a book first published in 1942 not only brings facts up to date but also includes new chapters, new maps and pictures, and sections completely rewritten on the basis of new investigations and field studies. Technical language has been kept to a minimum, the simplicity of the maps adds to their effectiveness, and the reproductions of photos are excellent both in quality and content. The book lacks, however, a general map of the Pacific Northwest as such, and maps for the various chapters have no standardization of the areas included. Some show parts of Canada while others stop at the international border. Some include data for more Montana counties than others, and some maps which include parts of Canada limit the data to U. S. areas. There is apparent agreement that the Pacific Northwest includes the Columbia River Basin and all of Washington, Oregon, Idaho, and Montana west of the Rocky Mountain Divide.

ARCH C. GERLACH

The Library of Congress

GEOGRAPHY OF NORTH AMERICA (Third Edition). George J. Miller, Almon E. Parkins, and Bert Hudgins. *John Wiley & Sons,* New York, 1954. 664 pp.

The appearance after a 20-year interval of the third edition of this much used text is an event. Dr. George J. Miller participated actively and Dr. Bert Hudgins replaced the late Dr. A. E. Parkins.

The organization and treatment is much revised After a substantial chapter on the Continent and one on the United States as a national unit, the U. S. is treated under four subdivisions: Northeastern States, the North Central Section, the South, and the West. Chapters under each subdivision necessarily vary somewhat in emphasizing the nature of the area and man's activities therein, but physiography in each case is first dealt with. The West has a separate chapter on climate as well. Agriculture is covered for all major subdivisions; industry and manufacturing appear to be adequately treated within space limitations. One may wonder a bit that fishing received a sepa-

rate chapter of 12 pages for the Northeast but was relegated to 2 pages for the West. Alaska receives an interesting separate chapter. Canada, after a general chapter, is well treated in four regional chapters. Mexico is covered in two chapters and Middle America in one.

Printing, and editing of text, maps, charts, and photos are of general high quality. Some will be annoyed by the fact that the relevant year has not been shown for the data utilized in many of the charts. Others will complain that cities, in which more than half of our population lives, have been on the whole, neglected. Some will doubt that the problems and natural defects of some areas have been adequately recognized. Others will wonder at the acceptance of the standard statement on soil erosion (p. 52) without giving consideration to the differing point of view of Kellogg and others. But it all adds up to a readable book which does cover our continent in a remarkable way in 664 pages, including a short index.

JOHN KERR ROSE

The Library of Congress

New Book on Geomorphology

A COMPREHENSIVE study of the origin, development, and characteristics of land forms, "Principles of Geomorphology," by William D. Thornbury, was published in May by John Wiley & Sons.

Dr. Thornbury places his emphasis on basic concepts and their applications to actual problems in the interpretation of complex landscapes. More than usual attention is therefore focussed on the history of the development of geomorphic ideas, while an early chapter is devoted entirely to fundamental concepts. The practical aspects of the subject receive particular consideration in the chapters entitled "Tools of the Geomorphologist" and "Applied Geomorphology." Other discussions center around soils and their use by geomorphologists, and the topography of ocean floors.

Following the tenets of the American school of geomorphology as founded by Powell, Gilbert, Davis, and others, the author nevertheless examines these concepts critically, evaluates them in the light of recent studies, and revises them to some extent. His discussions cover, among other topics, the fluvial cycle, stream deposition, the peneplain concept, the arid cycle, eolian land forms, karst topography, glaciers and icecaps, coasts, and volcanism.

"Principles of Geomorphology" contains 618 pages and is priced at $8.00.

Data Book for Civil Engineers

PUBLICATION of the second edition of Elwyn E. Seelye's "Field Practice," (Volume III of "Data Book for Civil Engineers") was recently announced by John Wiley & Sons. The appearance of this new edition brings the entire set up to date, the first two volumes having been modernized and enlarged two years ago.

"Field Practice" makes it possible for the inspector or field engineer to brief himself on any particular line of civil engineering work. An on-the-spot and independent reference that eliminates the necessity of other aids, "Field Practice" contains check lists for work on concrete, masonry, structural steel, welding, bridges, foundations, pile driving, timber, soils, grading, bituminous paving, sanitary construction, and pipe laying. Mr. Seelye has expanded the entire subject of piles, including additional material on sheet piling and illustrations of different types of piles.

Volume I of "Data Book for Civil Engineers" covers "Design" while Volume II deals with "Specifications and Costs." The second editions of both books were published by Wiley in 1952 and are priced at $10.00 and $5.00, respectively.

The second edition of Volume III contains 394 pages and is priced at $7.50.

MAP INFORMATION

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that though an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession.

—EDITOR

Topographic Maps

U. S. GEOLOGICAL SURVEY MAPS

THE FOLLOWING quadrangle maps were published or became available for distribution by the U. S. Geological Survey between March 1 and May 31, 1954. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown); water features (in blue); works of man, including cities, towns, and scattered habitations, schools, churches, railroads, roads and boundaries, and place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by General Land Office Surveys, township and section lines are shown. The State rectangular coordinate systems are indicated in the margins of the maps. An information folder further describing topographic maps and symbols is available on request.

Standard quadrangle maps may be obtained for 20 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C. (or Denver 15, Colo., for maps of areas west of the Mississippi River).

Alaska

BIG DELTA (B-4)*—Fourth Judicial Division
CORDOVA (D-8)*—Third Judicial Division
KENAI (A-4)*—Third Judicial Division
KETCHIKAN (C-4)*—First Judicial Division
KETCHIKAN (C-5)*—First Judicial Division
KETCHIKAN (C-6)*—First Judicial Division
PETERSBURG (A-5)*—First Judicial Division
PETERSBURG (B-3)*—First Judicial Division
PETERSBURG (B-4)*—First Judicial Division
SEWARD (A-5)*—Third Judicial Division
SEWARD (B-4)*—Third Judicial Division
SEWARD (B-5)*—Third Judicial Division
SEWARD (B-6)*—Third Judicial Division
SEWARD (C-6)*—Third Judicial Division
SEWARD (C-7)*—Third Judicial Division
SEWARD (D-4)*—Third Judicial Division
SEWARD (D-6)*—Third Judicial Division
SEWARD (D-8)*—Third Judicial Division
TAKU RIVER (A-4)*—First Judicial Division
TAKU RIVER (A-5)*—First Judicial Division
TAKU RIVER (A-6)*—First Judicial Division
TAKU RIVER (B-6)*—First Judicial Division
TALKEETNA MOUNTAINS (D-1)*—Third Judicial Division

California

ANTHONY PEAK*—Mendocino
ARAZ—Imperial
AUKUM—El Dorado

* Indicates 15-minute quadrangle; all others are 7½-minute quadrangles.
[1] Indicates a revised map. [2] Indicates a series-converted map.
† Indicates availability in either a contour or a shaded-relief edition.
‡ Indicates preliminary black and white edition.

BIGGS—Butte
CARPINTERIA[1]—Santa Barbara
CLARKSBURG—Yolo
CLEMENTS[1]—San Joaquin
COVELO*—Mendocino
COYOTE PEAK*[1]—Humboldt
DEEP WELL RANCH—Kern
ELK GROVE[1]—Sacramento
FIREBAUGH*[2]—Fresno
HACKAMORE*—Modoc
HOOPA*—Humboldt
HULL MOUNTAIN*—Lake
KLAMATH*[1]—Del Norte
LATHROP—San Joaquin
LEGGETT*—Mendocino
LINDEN[1]—San Joaquin
LITTLE TABLE MOUNTAIN—Madera
LOON LAKE—El Dorado
MEDICINE LAKE*—Siskiyou
MT. TAMALPAIS*[1]—Marin
NIPOMO*[1]—San Luis Obispo
OMO RANCH—El Dorado
ORICK*[1]—Humboldt
ORLEANS*—Humboldt
PASKENTA*—Tehama
RIPON[1]—San Joaquin
SAN LUIS OBISPO*[1]—San Luis Obispo
SANTA MARIA*[2]—Santa Barbara
SANTA RITA PARK*[2]—Merced
STOCKTON WEST—San Joaquin
TERMINOUS—San Joaquin
TIMBER MOUNTAIN*—Modoc

California-Arizona

BARD—Imperial

Colorado

CARLTON—Prowers
CHERAW—Otero
GRANADA—Prowers
GREASEWOOD GULCH—Rio Blanco
HAYSTACK BUTTE—Logan
HOLLY WEST—Prowers
HORSE MOUNTAIN—Garfield
JULESBURG—Sedgwick
LAMAR WEST—Prowers
MARKS BUTTE—Sedgwick
NO NAME RIDGE—Rio Blanco
PEETZ—Logan
PIKES PEAK—El Paso
PROCTOR—Logan
PROWERS—Bent
SEDGWICK—Sedgwick
YANKEE GULCH—Rio Blanco

Connecticut

DURHAM—Middlesex
HADDAM—Middlesex
HAMBURG—New London
HARTFORD NORTH[1]—Hartford
MARLBOROUGH[1]—Hartford

Florida

AVON PARK—Highlands
KENANSVILLE—Osceola
LAKE MARIAN NE—Osceola

Hawaii

HALAWA—Maui
ILIO POINT—Maui
KAMALO—Maui

Idaho-Oregon

OLDS FERRY—Washington
OLDS FERRY NW—Washington

Illinois

XENIA*—Clay

Illinois-Iowa

SAVANNA*—Carroll

Indiana

ANDERSON—Madison
BOGGSTOWN—Shelby
FAYETTE—Boone
GREENWOOD—Johnson
KOSSUTH—Washington
REELSVILLE—Putnam
SHELBYVILLE—Shelby

Iowa

PANORA*—Madison
WINTERSET*—Madison

Kansas

ALTON—Osborne
BLOOMINGTON—Osborne
OSBORNE—Osborne

Kentucky

ARTEMUS—Knox
BEATTYVILLE—Lee
BIGHILL—Madison
BRADFORDSVILLE—Marion
BRADFORDSVILLE NE—Casey
CALHOUN—McLean
CAMPBELLSVILLE—Taylor
CARLISLE—Nicholas
CLAYSVILLE—Harrison
CROFTON—Christian
CUMBERLAND FALLS—Whitley
DUNMOR—Muhlenberg
FENTON—Trigg
FORD—Clark
FRAKES—Bell
GLENVILLE—McLean
GRAVEL SWITCH—Marion
GREENVILLE—Muhlenberg
HANSON—Hopkins
HEDGES—Clark
MACKVILLE—Washington
MANNSVILLE—Taylor
MAUD—Washington
MAYS LICK—Mason
MILLERSBURG—Bourbon
MONT—Lyon
MOUNT OLIVET—Robertson
NEW HAVEN—Nelson
PANOLA—Madison
PARKSVILLE—Doyle
PHILPOT—Daviess
ROCKHOLDS—Whitley
SAXTON—Whitley
SHADY NOOK—Harrison
SHOPVILLE—Pulaski
SIDEVIEW—Montgomery
SLADE—Powell
SMITH MILLS—Henderson
TALLEGA—Lee
TOLLESBORO—Lewis
UTICA—Daviess
WHITLEY CITY—McCreary
WIBORG—McCreary
WINCHESTER—Clark
WOODSTOCK—Pulaski
WORTHVILLE—Carroll

Kentucky-Illinois

GROVE CENTER—Union

Kentucky-Indiana

VEVAY SOUTH—Switzerland
WILSON—Henderson

Kentucky-Ohio

MANCHESTER ISLANDS—Lewis

Kentucky-Tennessee

RUSHING CREEK—Stewart

Louisiana

ALLEMANDS[1]—St. Charles
EAST DELTA*—Plaquemines
HAHNVILLE[1]—St. Charles
LA PLACE[1]—St. John the Baptist
SATSUMA—Livingston

Maine

FIRST ROACH POND*—Piscataquis

Maryland

GERMANTOWN[1]—Montgomery
MYERSVILLE[1]—Frederick
URBANA[1]—Frederick

Maryland-Virginia

SENECA[1]—Montgomery

Massachusetts

NORTH BROOKFIELD[1]—Worcester

Massachusetts-Connecticut

MONSON[1]—Hampden
SOUTHBRIDGE[1]—Worcester

Michigan

ADAIR[1]—St. Clair
ALGONAC[1]—St. Clair
ARMADA[1]—Wayne
CARLETON[1]—Monroe
CLARKSTON[1]—Oakland
DETROIT[1]—Wayne
DETROIT-WAYNE AIRPORT[1]—Wayne
GOODELLS[1]—St. Clair
GWINN*—Marquette
HIGHLAND PARK[1]—Wayne
INKSTER[1]—Wayne
MT. CLEMENS EAST—Macomb
NEW BALTIMORE[1]—Macomb
NEW HAVEN—Macomb
NORTHVILLE[1]—Wayne
REDFORD[1]—Wayne
ROCKWOOD[1]—Wayne
ST. CLAIR FLATS[1]—St. Clair
THAYER*—Gogebic
UTICA[1]—Macomb
WALDENBURG—Macomb
WALLED LAKE[1]—Oakland
WAYNE[1]—Wayne
WYANDOTTE[1]—Wayne

Minnesota

BABBITT SE*—St. Louis
BARNESVILLE*—Clay
CENTERVILLE—Anoka
MORTON*—Renville
NEW BRIGHTON—Ramsey
RED LAKE FALLS*—Red Lake
WHITE BEAR LAKE WEST—Ramsey

Minnesota-Wisconsin

RED WING*—Goodhaven

Mississippi-Tennessee

DOSKIE—Tishomingo
KENDRICK—Alcorn

Missouri

LATHAM—Moniteau
LONE ELM—Cooper

Montana

BURNS MOUNTAIN—Beaverhead
DEVILS FENCE*—Jefferson
ELI SPRING—Beaverhead
ENNIS*†—Madison
GALLAGHER MOUNTAIN—Beaverhead
HELENA*†—Lewis and Clark
JEFFERSON ISLAND*—Madison
MONUMENT RIDGE*—Madison
SEDAN*—Gallatin
SPANISH PEAKS*—Gallatin
TORREY MOUNTAIN—Beaverhead
TOSTON*—Broadwater

Nebraska

ALMERIA—Loup
ALMERIA NE—Loup
ALMERIA NW—Blaine
ALMERIA SW—Loup
BREWSTER—Blaine
BREWSTER NW—Blaine
BREWSTER SE—Blaine
COMSTOCK SE—Valley
ELYRIA—Valley
SARGENT EAST—Custer

Nevada

CARLIN*—Elko
DIXIE FLATS*—Elko

New Jersey

BRIDGETON—Cumberland
BUENA—Atlantic
RUNNEMEDE—Camden
WILLIAMSTOWN—Gloucester

New Mexico

CLOUDCROFT*—Otero
DALIES NW—Bernalillo
ESPUELA—Eddy

HAGERMAN SW—Chaves
HORCADO RANCH—Santa Fe
LOS LUNAS—Valencia
THREE RIVERS*—Otero

New York
CAPE VINCENT SOUTH—Jefferson
COBLESKILL—Schoharie
DRESDEN—Yates
FAIR HAVEN—Cayuga
GULF SUMMIT—Broome
HAMMOND*[2]—St. Lawrence
HANNIBAL—Oswego
MIDDLESEX—Yates
OTSELIC—Chenango
OWASCO—Cayuga
SENECA FALLS—Seneca
SODUS—Wayne
SOUTH RUTLAND—Jefferson
WARWICK—Orange
WURTSBORO—Sullivan

New York-New Jersey
PINE ISLAND—Orange

North Dakota
BLOOM—Stutsman
ELDRIDGE—Stutsman
ELDRIDGE NW—Stutsman
ELDRIDGE SE—Stutsman
JUD NW—Stutsman
PINGREE SW—Stutsman

Ohio
ALLIANCE—Stark
DAMASCUS—Mahoning
SALEM—Columbiana

Ohio-Michigan
POINT PLACE[1]—Lucas
TOLEDO[1]—Lucas

Oregon
NEHALEM*—Tillamook

Oregon-Washington
CLATSKANIE*[1]—Columbia

Pennsylvania
GERMANTOWN—Philadelphia
HARRISBURG*—Dauphin
NORRISTOWN—Montgomery

South Dakota
DEEP CREEK NE—Perkins
DEEP CREEK SE—Perkins
LANTRY NE—Dewey
PUTNEY—Brown
WESTPORT—Brown

Tennessee
ANTIOCH—Davidson
HERMITAGE—Davidson
LA VERGNE—Rutherford

Tennessee-Kentucky
BUCHANAN—Henry

Texas
BLAND—Bell
COPPERAS COVE—Coryell
CRANE ISLANDS—Nueces
FORT HOOD—Coryell
GATESVILLE EAST—Coryell
GATESVILLE WEST—Coryell
KILLEEN—Bell
LEON JUNCTION—Coryell
LOLITA—Jackson
LONG ISLAND—Calhoun
MAYER—Potter
McMILLAN MOUNTAINS—Bell
MESQUITE BAY—Aransas
NOLANVILLE[2]—Bell
NORTH FORT HOOD—Coryell
OGLESBY—Coryell
PANTHER POINT—Calhoun
PANTHER POINT NE—Calhoun
PASS CAVALLO SW—Calhoun
PIDCOKE—Coryell
PLACEDO—Victoria
PLEMONS—Hutchinson
PORT O'CONNOR—Calhoun
POST OAK MOUNTAIN—Bell
PRINGLE—Hutchinson
PUENTE—Potter
PURMELA—Coryell
ST. CHARLES BAY—Aransas
ST. CHARLES BAY SE—Aransas
SARGENT—Matagorda
SEA DRIFT NE—Calhoun
SHELL MOUNTAINS—Coryell
STINNETT STATION—Hutchinson
SWEENEY—Brazorio
TIVOLI—Refugio
TWIN MOUNTAINS—Coryell

Texas-Louisiana
PORT ARTHUR SOUTH[3]—Jefferson
WIERGATE*—Newton

Utah
ANTELOPE ISLAND SOUTH—Davis
‡BECKWITH PEAK SW—Emery
CLAY BASIN—Daggett
‡EMERY 1 NE—Emery
‡EMERY 1 SE—Emery
‡EMERY 4 NE—Emery
‡EMERY 4 SE—Emery
GARFIELD—Salt Lake
GOSLIN MTN.—Daggett
LARK—Salt Lake
MAGNA—Salt Lake
‡MOAB 4 NW—Grand
‡RED PLATEAU SE—Emery
‡RED PLATEAU SW—Emery
SANTAQUIN PEAK*—Utah
‡TIDWELL 3 NW—Emery
‡TIDWELL 4 NE—Grand
‡TIDWELL 4 SE—Emery
‡WILSONVILLE SE—Emery

Utah-Wyoming
DUTCH JOHN MTN.—Daggett
FLAMING GORGE—Daggett

Vermont
MT. MANSFIELD*[2]—Lamoille

Virginia
SOMERVILLE[1]—Fauquier
STORCK[1]—Stafford
YORKTOWN[1]—York

Virginia-Maryland
STERLING[1]—Loudoun

Washington
ALADDIN—Stevens
ALGER—Skagit
BERTRAND CREEK—Whatcom
BOUNDARY—Stevens
COLVILLE—Stevens
GLACIER PEAK*—Snohomish
HAMILTON*—Skagit
LAWRENCE—Whatcom
LEADPOINT—Stevens
LYNDEN—Whatcom
MOUNT OLYMPUS*[2]—Jefferson
SUMAS—Whatcom
WHITE MUD LAKE—Stevens

Wisconsin
BELMONT—Lafayette
DODGEVILLE—Iowa
LINDEN—Iowa

Wyoming
ALPINE LAKE—Fremont
BADWATER NE—Natrona
BADWATER SE—Natrona
BARGEE—Fremont
BLUE HOLES—Fremont
BULL LAKE WEST—Fremont
BULL MOUNTAIN—Hot Springs
BURRIS—Fremont
CROWHEART—Fremont
CROWHEART BUTTE—Fremont
CROWHEART NE—Fremont
CROWHEART NW—Fremont
ERVAY BASIN—Natrona
HAYS PARK—Fremont
HUDSON—Fremont
KIRKLAND PARK—Fremont
LANDER NW—Fremont
LANDER SE—Fremont
RAY LAKE—Fremont
ST. LAWRENCE BASIN—Fremont
WIND RIVER—Fremont

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Georgia-South Carolina
AUGUSTA

Texas-Louisiana
PORT ARTHUR

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Building, Detroit 26, Mich., at 75 cents per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States.

41.—Detroit River from three miles south of Detroit River Light to Windmill Point, Mich. (April 1954.)

42.—Lake St. Clair, the entire lake including St. Clair River to Woodtick Island, at 1:60,000. (March 1954.)

70.—North end of Lake Michigan, north of Arcadia, Mich., and Kewaunee, Wis., at 1 : 240,000. (June 1954.)

75.—South end of Lake Michigan from Waukegan, Ill., to South Haven, Mich., at 1 : 120,000, with an inset of Michigan City, Ind., at 1 : 10,000. (March 1954.)

98.—Coast chart. Isle Royale, Mich., including Thunder Bay, Ont., and coast from Grand Portage Bay, Minn., to Shesheeb Point, Ont., at 1 : 120,000. (June 1954.)

726.—Lake Winnebago, Wisc., at 1 : 60,000; and Fox River, Wis., from Lake Winnebago to De Pere, Wis., at 1 : 30,000. (February 1954.)

763.—Holland Harbor, Mich., and Lake Macatawa, at 1 : 15,000. (April 1954.)

767.—Muskegon, Mich., and Muskegon Lake, at 1 : 15,000. (April 1954.)

774.—Ludington, Mich., and Pere Marquette Lake, at 1 : 5,000. (April 1954.)

Public Land Survey Plats

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management, U. S. Department of the Interior, between December 1, 1953, and May 31, 1954. The class or purpose of the survey is indicated. Copies of the plats may be secured from the Bureau Offices in the State or from the Director, Bureau of Land Management, Department of the Interior, Washington 25, D. C.

Alaska

Anchorage 016916—U. S. Survey 3110
Fort Yukon Municipal Airport—U. S. Survey 3191
Gastineau Channel Group—U. S. Survey 3171
Gastineau Channel Group—U. S. Survey 3172
Gastineau Channel Group—U. S. Survey 3173
Gastineau Channel Group—U. S. Survey 3174
Gastineau Channel Group—U. S. Survey 3272
Girdwood Group—U. S. Survey 3043
Girdwood Group—U. S. Survey 3044
Girdwood Group—U. S. Survey 3045
Glacier Highway Group—U. S. Survey 3258
Glacier Highway Group—U. S. Survey 3259
Glacier Highway Group—U. S. Survey 3274
Homesite—U. S. Survey 3215
Homestead—U. S. Survey 3234
Homestead Entry Survey—254
Indian Creek Group—U. S. Survey 3200
Mendenhall Peninsula Group—U. S. Survey 3260
Mendenhall Peninsula Group—U. S. Survey 3261
Mendenhall Peninsula Group—U. S. Survey 3273
Resurvey of U. S. Survey No. 2120—U. S. Survey 3262
Salchaket Lake Group—U. S. Survey 3204
Salchaket Lake Group—U. S. Survey 3205
Salchaket Lake Group—U. S. Survey 3206
Salchaket Lake Group—U. S. Survey 3207
Salchaket Lake Group—U. S. Survey 3208
Salchaket Lake Group—U. S. Survey 3209
Salchaket Lake Group—U. S. Survey 3210
Salchaket Lake Group—U. S. Survey 3211
Salchaket Lake Group—U. S. Survey 3212
Salchaket Lake Group—U. S. Survey 3213
Salchaket Lake Group—U. S. Survey 3214
Smuggler's Cove Group—U. S. Survey 3297
Soldiers' Additional Homestead—U. S. Survey 3126
South Point Higgins Group—U. S. Survey 3156
Spruce Cape Group—U. S. Survey 3233
Subdivision of U. S. Survey No. 1897—U. S. Survey 1897 A
Thane Small Tract Group—U. S. Survey 3269
Thane Small Tract Group—U. S. Survey 3271
Townsite of Bethel—U. S. Survey 3230 A & B

Alaska—Seward Meridian

T. 2 N., R. 12 W., extension survey
T. 5 N., R. 9 W., subdivision of section
T. 5 N., R 11 W., subdivision of section
T. 5 N., R 12 W., subdivision of section
T. 6 N., R. 11 W., subdivision of section
T. 6 N., R. 12 W., survey and meanders
T. 6 S., R. 14 W., subdivision of section
T. 7 N., R. 11 W., extension survey
T. 7 N., R. 12 W., survey and meanders
T. 7 S., R. 13 W., subdivision of section
T. 15 N., R. 1 W., subdivision of section
T. 19 N., R. 3 E., subdivision of section
T. 19 N., R. 4 E., subdivision of section

Alaska—Fairbanks Meridian

T. 1 S., R. 1 E., subdivision of section
T. 2 S., R. 2 E., subdivision of section
T. 5 S., R. 4 E., subdivision of section
T. 6 S., R. 4 E., subdivision of section

Arizona—Gila and Salt River Meridian

T. 1 N., R. 8 E., subdivision of section (2)
T. 11 N., R. 2 E., resurvey
T. 11 N., R. 2 E., subdivision of section (2)
T. 11 S., R. 29 E., resurvey
T. 14 S., R. 12 E., subdivision of section
T. 14 S., R. 13 E., subdivision of section
T. 15 S., R. 12 E., subdivision of section (2)
T. 15 S., R. 13 E., subdivision of section

Arkansas—5th Principal Meridian

T. 14 N., R. 9 W., resurvey

California—Mount Diablo Meridian

California-Nevada State boundary (California and Nevada resurvey)
T. 11 N., R. 20 E., resurvey (California and Nevada)
T. 12 N., R. 18 E., resurvey (California and Nevada)
T. 12 N., R. 19 E., resurvey (California and Nevada)
T. 13 N., R. 18 E., resurvey (California and Nevada)
T. 24 S., R. 45 E., survey of tract
T. 31 N., R. 5 W., subdivision of section

Colorado—6th Principal Meridian

T. 1 S., R. 95 W., resurvey
T. 3 S., R. 42 W., resurvey
T. 3 S., R. 43 W., resurvey
Ts. 3 & 4 S., R. 42 W., Colorado-Kansas State boundary, resurvey
T. 4 N., R. 70 W., completion survey
T. 4 N., R. 73 W., subdivision of section
T. 4 S., R. 42 W., resurvey
T. 4 S., R. 43 W., resurvey
T. 4 S., R. 95 W., extension survey
T. 4 S., R. 96 W., extension survey
T. 5 N., R. 70 W., completion survey
T. 5 N., R. 71 W., resurvey
T. 5 S., R. 42 W., resurvey
T. 5 S., R. 43 W., resurvey
T. 6 N., R. 69 W., resurvey
T. 7 N., R. 69 W., resurvey
T. 7 N., R. 70 W., resurvey
T. 9 S., R. 100 W., survey and resurvey
T. 45 N., R. 19 W., completion survey
T. 45 N., R. 20 W., completion survey
T. 47 N., R. 17 W., resurvey
T. 48 N., R. 17 W., resurvey
T. 48 N., R. 18 W., resurvey

Florida—Tallahassee Meridian

T. 27 S., R. 37 E., resurvey

Idaho—Boise Meridian
T. 9 S., R. 24 E., subdivision of townsite
T. 39 N., R. 3 E., subdivision of townsite

Louisiana—St. Helena Meridian
T. 1 S., R. 1 W., subdivision of section

Mississippi—Washington Meridian
T. 4 N., R. 6 E., subdivision of section

Missouri—5th Principal Meridian
T. 34 N., R. 13 W., island survey

Montana—Principal Meridian
T. 1 N., R. 10 W., subdivision of section
T. 1 S., R. 11 W., subdivision of section
T. 1 S., R. 34 E., resurvey
T. 2 N., R. 12 W., subdivision of section
T. 2 S., R. 34 E., resurvey
T. 3 S., R. 34 E., resurvey
T. 3 S., R. 35 E., resurvey
T. 4 S., R. 31 E., resurvey
T. 4 S., R. 32 E., resurvey
T. 4 S., R. 35 E., resurvey
T. 5 S., R. 31 E., resurvey
T. 5 S., R. 32 E., resurvey
T. 6 S., R. 31 E., resurvey
T. 16 N., R. 14 W., island survey

Nevada—Mount Diablo Meridian
T. 7 N., R. 43 E., resurvey
T. 8 N., R. 43 E., resurvey
T. 9 N., R. 45 E., resurvey
T. 12 N., R. 20 E., resurvey
T. 14 N., R. 21 E., resurvey
T. 28 N., R. 28 E., completion survey
T. 29 N., R. 27 E., original survey (2)

New Mexico—New Mexico Principal Meridian
T. 26 S., R. 20 W., subdivision of section

Oregon—Willamette Meridian
T. 19 S., R. 6 W., resurvey
T. 20 S., R. 10 W., resurvey

Utah—Salt Lake Meridian
T. 23 S., R. 7 E., survey and resurvey
T. 24 S., R. 7 E., original survey
T. 25 S., R. 6 E., original survey
T. 25 S., R. 7 E., original survey
Ts. 40 & 41 S., Rs. 24, 25 & 26 E., survey of exteriors
Ts. 40 & 41 S., R. 24 E.; T. 41 S., R. 25 E., survey of exteriors
Ts. 42 & 43 S., Rs. 21, 22 & 23 E., survey of exteriors
Ts. 42 & 43 S., Rs. 24, 25 & 26 E., survey of exteriors

Maryland Issues New State Road Maps

NEW ROAD MAPS prepared by the State of Maryland and containing twenty color photographs on the reverse side, were made available to the public on July 15, 1954. George W. Cassell, State Roads Commission engineer in charge of mapping, said that Maryland until now has trailed other Eastern States in using official and attractive State road maps to promote tourist trade and other industries. Copies of the map may be obtained free of charge by writing the State Roads Commission, 307 Tower Building, Baltimore 2, Md.

Aerial Survey of Liberia Being Completed

ARTHUR SHERMAN, Director of the Bureau of Mines and Geology, Republic of Liberia, was in the United States until recently to expedite preparation of the aerial photo mosaics which will form the basis of an up-to-date map of Liberia. Publication of this map is scheduled for early 1955.

The aerial photos for this map were taken at sufficiently large scale to permit an interpretation of national resources and will be useful for engineering data, agricultural purposes, public health studies, forestry evaluation, census, the assessment of internal revenues, and other purposes.

The survey was conducted by Aero Service Corporation of Philadelphia and paid for jointly by the Liberian and U. S. governments. The work was supervised on the American side by the Deputy of the Director of the U. S. Coast and Geodetic Survey, and on the Liberian side by the Bureau of Mines and Geology, R. L. The field work was done during the two dry seasons of 1951–52 and 1952–53 with 87 percent coverage of the country.

This is one of the few aerial surveys in which shoran equipment for precise control was used. The remaining 13 percent of the country to be surveyed is being covered by the airplane of the Liberian Cartographic Service, associated with the Bureau of Mines and Geology under the Department of the Treasury, R. L.

A magnetometer survey over approximately one-fourth of the whole country was flown in search of magnetic ores and, in addition, a radiation survey for radioactive minerals was made at the same time. While in the United States, Mr. Sherman also worked on the magnetic charts and radiation profiles which are being prepared in Philadelphia and New York.

Reprinted from *Liberia Today*, June 1954, page 2.

Comment and Discussion

The pages of SURVEYING AND MAPPING are open to a free and temperate discussion of all matters pertaining to the interests of the CONGRESS. It is the purpose of this Department to encourage comments on published material or the presentation of new ideas in an informal way.
—EDITOR

LOCAL SECTION OBJECTIVES

LOGAN N. MUIR* (To George C. Bestor, L.S., Carmel, Calif.)—I have received and thoroughly enjoyed your letter on the American Congress on Surveying and Mapping, our Northern California Section of the ACSM, and its Property Surveys Division. All points are well received and many are already included in our plans.

First, the Northern California Section is planning a Sacramento meeting for Friday, June 11, 1954, on the provocative and controversial question of whether or not registration or licensing shall be required of one preparing topographic maps for engineering purposes. You are probably aware of the recent opinion of the Attorney General which, in a certain case, states that registration or licensing is not required for such a map. Our plan is to present a panel of two pros and two cons. The issues will be determined in advance of the meeting to eliminate the chaff and get at the kernel. An audience question-and-discussion period will follow the presentations and rebuttals of the panel.

Now, before commenting on membership and meetings generally I would like to present a view in capsule form that concerns both. During the first year or two of the Northern California Section we were mainly involved in setting it up and getting it started. This has been done. Now, I think, we should set up specific objectives to give us direction. Mere growth and activity without these will be only temporary—the result of temporary enthusiasm. Briefly, I believe the following objectives within the framework of those of the parent organization should be aggressively and persistently pursued:

1. *Professionalism.*—This should be the goal of everyone in surveying and mapping from those directing a large organization down to and including chainmen and draftsmen. Supervisors must not only impart to those under them a professional attitude toward their work but must deal with them in professional manner. The people in the lower categories are not mere laborers or craftsmen—they are apprentices to a profession.

2. *Education.*—We can never build up the prestige of the land surveyor and his employees until we require more stringent qualifications in education and experience. I have in mind here a coverage far broader than now recognized in the fields of land measurement and mapping, land use, land planning, land appraisal including timber cruising and appraisal, and land titles, together with the entire field of improvements to the land itself such as drainage, roads, erosion control, green belts, land leveling, and so on, with the land surveyor as the consultant or expert in these matters. To achieve this requires a new look at our present educational programs for surveyors and engineers.

8. *Modernization.*—We are going to lose our field to the photographers and electrical engineers by forfeit if we don't get busy and acquaint ourselves with modern methods and their proper applications to our work. We are already letting the great field of topographic mapping slip into the hands of the optics and photography specialists (who, by the way, have contributed mightily to certain phases of mapping and surveying). Tomorrow, we will lose out in the field of electronic measurement. Day after tomorrow, who knows? It's not too early to be thinking about it.

As to scheduling meetings, then, I think they should be worked up well in advance based on these stated objectives, enlarging on them, dealing with them in their many specific phases. In planning meetings of the Property Surveys Division, the months of May and October should be reserved for the meetings of the entire Northern California Section. It seems an excellent idea to schedule quarterly meetings at least for the PSD to be held in the Bay Area and Sacramento and I am very strongly in favor of organizing meetings in the outlying areas under the jurisdiction of the Northern California Section.

* Chairman, Northern California Section, American Congress on Surveying and Mapping.

With all these thoughts in mind, we should encourage all surveyors and mappers and their employees to join (1) the American Congress on Surveying and Mapping, (2) the Northern California Section of ACSM, and (3) the Property Surveys Division if they are interested.

SOCIAL SECURITY AND THE SURVEYOR

(EDITOR'S NOTE—There has been a good deal of confusion and doubt among surveyors over their status under the Social Security laws. The following series of letters illustrates some of the questions that have been raised and some of the answers.)

WALTER S. DIX* (to Daniel C. Cooper, Professional Engineer and Land Surveyor, Watertown, N. Y.)—This will acknowledge receipt of your letter of November 26 with the copies of your correspondence with Social Security Board officials on the matter of your request for Social Security Insurance credit for earnings as a surveyor in the years 1946, 1947, 1948, and 1949, which were years when the United States Census classifications classed surveyors as sub- or semiprofessional in occupation, for which reason, therefore, you feel entitled to earnings credit accordingly.

The problem is indeed a real one, especially to those interested pertinently in credits for Social Security Insurance benefits. It is not a simple problem either, being fraught with complexities contingent with current problems of the fields of surveying and mapping concerning what is professional and what is not, and what is engineering and what is not, with considerable pro and con, and evidence showing claim and disclaim in an alarming state of contradiction.

The National Council of State Boards of Engineering Examiners do recognize a distinction between engineering surveys and land surveys. Now, whether that implies land surveying is not engineering or means that land surveying is engineering plus something else, can be argued at great length. The distinction may be intended to indicate that while the ordinary civil engineer is well qualified to do certain types of engineering surveys for himself or others, he must be otherwise trained in order to qualify adequately as a land surveyor. Perhaps he must have some legal training or equal experience as added qualification. That could be argued as good reason for some States requiring two licenses—one for professional engineering and another for land surveying. I hold two licenses myself, as do you.

As long as engineers and surveyors and various State boards and professional societies are currently apparently confused in the matter, one can perhaps hardly blame various administrative agencies or other professions for being equally confused. Much education in these matters is obviously imperative if such confusion is to be removed.

The problem you present may well be one of interest to the Property Surveys Division of ACSM, and I am forwarding your letter to the Chairman for possible consideration. Your own particular problem seems to be one of pleading logic and hoping for understanding acquiescence, and hammering away until you get it or give up—or you could put such a matter to court if determined and so inclined and able to underwrite such costly procedure. You might, by active participation in ACSM Property Surveys Division, find enough others in similar interest to support your viewpoints.

* Executive Secretary, ACSM.

VICTOR H. GHENT† (Excerpt from letter to members of Virginia Association of Surveyors, Inc.)—Present instructions to Social Security field offices say that if a surveyor holds an engineer license, then because the fields are so closely allied, he shall be considered as a professional engineer. Regardless of how you feel on inclusion under Social Security (I feel that you cannot buy cheaper security for your family, disregarding the old age benefits), the thing of prime importance is that many States and the National Examination Board recognize professional status for land surveyors and engineers as separate professions. We are receiving a setback if we allow this interpretation by the Federal Government to go unchallenged. WHAT IS YOUR OPINION?

EARL W. LYMAN‡ (to ACSM)—How do you classify a licensed land surveyor? As a profes-

† Secretary, Virginia Association of Surveyors, Inc.

‡ Licensed Land Surveyor, Bloomington, Calif.

sional engineer or an ordinary business man? This is for the purpose of Social Security taxation.

In this state (California) we are licensed by the State Board for Civil and Professional Engineers; the difference between a licensed land surveyor and a professional engineer is that the licensed land surveyor licenses are limited to land surveying and allied work while the professional engineer boys do general engineering construction.

According to the local Social Security Board, professional engineers are not covered by Social Security, but land surveying is not mentioned at all so they hold we are covered. If we are classed as professional engineers we would be exempt.

In my own case I would much prefer to be exempt.

WALTER S. DIX (Reply to Earl W. Lyman letter, above)—This will acknowledge your letter of January 5 inquiring about classification of the licensed land surveyor in respect to being covered or not covered under rulings of the Social Security regulations.

The American Congress on Surveying and Mapping has taken no official step in this Social Security coverage matter to date, nor has any of ACSM's corporate divisions or sections, for one very good reason, that the matter is complex by viewpoints on the "security matter" itself as well as on the matters of professional recognition within or without engineering. Not enough basic information has been assembled to crystallize into clear pro and con upon which to guide discussion toward considered opinions.

There seems to be clear evidence that many rulings are arrived at arbitrarily, often by influenced opinion based on other arbitrary rules, regulations, and/or classifications. Recognition of land surveying as professional in its own right has been delayed considerably by lingering effect of past classifications of surveying in U. S. Census and Labor volumes, as well as by the practicing engineer-surveyor invariably stressing his engineer status rather than surveyor, even though many times the larger percentage of endeavor has been in the survey phases. This particularly helps to confuse the clear-cut recognition of the field of land surveying as against engineering surveying by the engineering professionals themselves. One can hardy blame the various administrative agencies for being somewhat unclear on the issues themselves.

Attached copies of Secretary Ghent's Virginia Association letter excerpt, and my 1951 letter to Mr. Cooper, will show that varying viewpoints on the topic exist. It will be interesting to see what results come from Secretary Ghent's canvass of several surveying organizations.

Apparent are points of issue on clear-cut recognition of the field of land surveying as a profession in itself—which brings up the need for classification recognition of the professional (registered or licensed) surveyor as against classifications for survey-men and survey workers.

Then there is the issue of "to be" or "not to be" covered under the security provisions. Arguments may be presented on both viewpoints, with varying viewpoints in between.

If these issues give impetus to discussion at ACSM's 14th Annual Meeting sessions, in March, ACSM may be in better position to state a considered viewpoint of its Property (or Land) Surveys Division and the ACSM Committee on Professional Status. (EDITOR'S NOTE: *See* first two paragraphs, page 244, President's Message in report of the Annual Business Meeting, SURVEYING AND MAPPING, April–June 1954).

I am passing copies of your letter along to key ACSM chairmen accordingly. You may even be hearing from some of them as individuals, prior to developing further organization opinions.

VICTOR H. GHENT (to members of Virginia Assôciation of Surveyors, Inc.)—Herewith, without comment, is an opinion just rendered to us by the Treasury Department:

This is in further reference to your letter dated April 2, 1954, relating to the status under the Self-Employment Contributions Act, of individuals who are licensed both as professional engineers and as land surveyors. . . .

. . . Although, as you have pointed out, many of the States make a distinction between land surveying and professional engineering, providing completely separate registrations for the two activities, it is our understanding that land surveying is a subfield of civil engineering, along with such subfields as construction, highway, hydraulic, municipal, railway, sanitary, structural, and transportation engineering. Accordingly, it is our conclusion that a registered professional engineer who also performs services as a land surveyor is considered to be engaged in a single professional enterprise, i.e., engineering, and no part of his earnings may count toward obtaining security coverage. Furthermore, the professional exclusion is applicable only if the individual concerned meets the legal requirements, if any, for the practice of his profession in the place where the services are performed. This conclusion may be reached even though a registered professional en-

gineer performing land surveying services does not actually engage in engineering work, provided he holds himself out to the public or advertises himself in any way by reason of telephone listings, letter heads, etc., as a professional engineer. However, if a licensed professional engineer does not practice engineering and does not hold himself out in any way as being a professional engineer, his activities as a land surveyor would not be excluded from trade or business, and the income derived by him as an independent contractor from such activities would constitute earnings from self-employment.

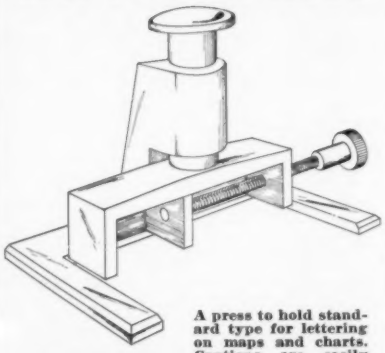
The conclusions reached in this letter are based on the Internal Revenue Code now in effect. The Congress is considering a bill which if enacted would make substantial changes in the Code, many of which may be retroactive. If any such changes are made in the provisions of law affecting the activities of the professions here involved, the tax consequences of such activities will be determined under the new law.

Analytics as a Substitute for Triangulation

BULLETIN NO. 3 of the Maryland Bureau of Control Surveys and Maps is now available in final form which follows substantially the proof, copies of which were distributed at the Fourteenth Annual Meeting of ACSM. This bulletin is entitled "Analytics as a Substitute for Triangulation" and shows how otherwise intricate problems in triangulation are readily solved by the use of linear equations representing the observed lines. The problem is primarily one of systematizing the work so that the equations as derived may readily be collated and thus collected on the station record card. By plotting these lines at a very large scale, a graphic picture of the closure results.

There are many interesting advantages in the technique developed by the Maryland Bureau of Control Surveys and Maps. Copies are available on application to the Maryland Bureau of Control Surveys and Maps, 306 Tower Building, Baltimore 2, Md.

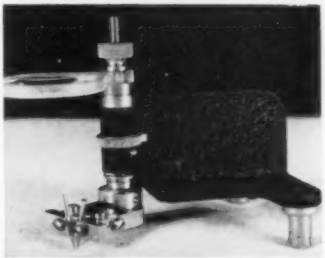
CARTOGRAPHER
CAPTION PRESS



A press to hold standard type for lettering on maps and charts. Captions are easily and permanently imprinted on original work. Type holding space . . . 2¾" long, 5/8" wide, 7/8" high. Rigidly constructed.

BOWEN & COMPANY, Inc.
Box 5818
Bethesda, Maryland

UNI-GRAVERS
Scribing Instruments
FOR PAINT-COATED PLATES



■ Uni-gravers employ either needles or flat blades in an interchangeable adapter (pat. pending) . . . Of brass with wrinkled finish and nickel plating . . . Have Bausch & Lomb 2" focal length optic adjustable at any position.

Write for Catalog
UNIVERSAL INSTRUMENT CO.
3807-11 Bunker Hill Road
Brentwood, Md.

News of Related Organizations

New Hampshire Society of Engineers, Land Surveyors Committee

Two meetings under the auspices of the Land Surveyors Committee of the New Hampshire Society of Engineers were held early in 1954. The first, an all-day meeting of surveyors held in Concord on February 13, was devoted to an exhibition of survey instruments in the forenoon, and two discussions in the afternoon, "The Economic Status of the Surveyor," and "Perpetuation of Survey Monuments."

The second meeting was held on May 8 in the Civil Engineering Department, Kingsbury Hall, College of Engineering, University of New Hampshire. The highlight of the meeting was a talk by Carroll F. Merriam on recent advances in surveying techniques and on the plane coordinate system. Mr. Merriam's talk was preceded by a tour of Kingsbury Hall, conducted by Russell Skelton of the Civil Engineering Department, and was followed by a dinner. After dinner there was a two-hour question-and-answer session on the plane coordinate system, and a discussion of the objectives of the American Congress on Surveying and Mapping. Those attending included faculty members of the University, representatives of the New Hampshire Department of Highways and Public Works, and private surveyors. All were most enthusiastic about the opportunity to meet and talk with Mr. Merriam.

—Gerald R. Hyde

North Carolina Society of Engineers

The 36th Annual Meeting of the North Carolina Society of Engineers was held at Raleigh, N. C., January 28 and 29, 1954. Committee reports of interest to ACSM readers are reprinted below from the April 1954 issue of *North Carolina Engineer*.

Committee on Land Surveying

Your committee on Land Surveying has been working diligently for several years in an effort to present the great need for improvement in the method of making and recording land surveys, and during the past year these efforts have culminated in the passage of the bill through both Houses of the Legislature which authorized and directed the Board of Registration for Engineers and Land Surveyors to proceed with compiling a manual of instructions for land surveyors and for engineers engaged in land surveying.

We take great pride in seeing this definite step forward after all the frustrations of former years, and we feel that with the continued support of the Society, this manual can be prepared in such a manner that it will not only give the surveyor or engineer the specific technical data which he needs in order to make the proper sort of survey, but also chapters can be directed to the landowner, pointing out to him the immense advantage of having his lands monumented, described, mapped, and recorded correctly. We are convinced from personal experience that many landowners are unaware of the importance to them of having this work done properly and we feel that this attitude on the part of the landowner has prevented or discouraged many surveyors in doing the work much better than it has been done.

If this manual can be written to cover both phases of the situation; that is, the technical aspects on the one hand and the landowners' interest on the other, we can expect a vast improvement in the method of making land surveys.

When the manual has been completed, we recommend that the Society publicize it as much as possible, and that short articles be prepared for the local papers throughout the State in an effort to acquaint the landowners with the in-

different work which has been done in the past and to point out how he, as a landowner, can easily justify the very slight expense of having his land properly surveyed and recorded.

We wish to take this opportunity to express our appreciation for the encouragement and assistance which we have received from innumerable members of the Society in carrying out our committee assignment.

Committee on Topographic Mapping

A committee on Topographic Mapping was appointed very soon after the North Carolina Society of Engineers was organized, but thus far this Committee has been unable to arouse any sustained interest in a large-scale program of modern topographic mapping for North Carolina. In spite of our own failure, we wish to note with envy, and to report for the record, the success of a cooperative program of topographic mapping which is now nearing completion in the State of Kentucky.

In Kentucky all work of mapping is being done by the United States Geological Survey, and the cost of the work is being shared equally between the Federal government and the State of Kentucky. The original program of cooperative mapping by the USGS began in Kentucky in 1882 and ended in 1929. The second program of cooperative topographic mapping got into full-scale operation in January 1950, and will be 85 percent complete by July 1, 1954. This second program is the largest program of cooperative mapping ever undertaken by the USGS. It has had the full backing and encouragement of the Kentucky State Chamber of Commerce, and the following Kentucky State departments: Geological Survey, Highways, Conservation, Revenue, and Agriculture and Development Board. Because of a State property tax, the Department of Revenue was vitally interested in the preparation of adequate base maps for property surveys and valuation.

The State of Kentucky has a land area of 40,500 square miles, and the total cost of this new program is estimated to be seven million dollars. The area of North Carolina is 52,700 square miles, and if the costs were comparable, a similar program for North Carolina would cost nine million dollars, half of which would be borne by the Federal government. While this initial cost may seem large, the ultimate return to North Carolina would be many times as large. The whole United States lags behind every enlightened country in the world in its topographic mapping program, and the continuing failure of North Carolina to take advantage of the financial and technical assistance of the Federal government and thereby to provide adequate map coverage for this State, is a large and difficult handicap for the orderly exploitation of agricultural and industrial facilities.

We recommend that the North Carolina Society of Engineers forward a copy of this report to the Governor, the Department of Conservation and Development, the State Highway and Public Works Commission, the Budget Bureau, and the Institute of Government, together with a resolution urging the initiation of a similar program for the State of North Carolina.

The North Carolina Society of Engineers at its 1954 Annual Meeting in Raleigh conferred its Annual Engineering Award upon R. Getty Browning, Chief Locating Engineer, N. C. State Highway and Public Works Commission.

The citation of the Engineering Awards Committee, T. C. Heyward, Sr., *Chairman*, T. J. Hewitt, C. L. Mann, Sr., and P. D. Davis, is as follows:

In recognition of his contribution to the Engineering Profession as in evidence:

For his outstanding work as Chief Locating Engineer for the Highway and Public Works Commission of the State of North Carolina.

For his personal and thorough examination of sites, bringing to the citizens of the State routes of maximum scenic value, selected with meticulous care to produce the greatest possible safety and most economical construction cost.

For that there would be required the sacrifice of personal liberties on the part of many property holders, his intimate knowledge and understanding of the human problems involved, enabled him through these years to uphold the enforcement of the law, with honor and yet with all consideration of the rights of the individual.

For his wide and persistent work in the field of surveying, where, in his intensive efforts over the many years he headed the Surveying Committee of this Society, he endeavored to foster and secure legal methods of procedure that would bring a clearer conception of the whole science of surveying, and procure records of undeviating accuracy.

For his marked integrity, combined with the unswerving directness of his efforts, as he saw his duty in his concept of his work in the Engineering Profession.

The North Carolina Society of Engineers, through its Board of Directors, presents its award for Outstanding Engineering Achievement to R. Getty Browning.

One of Mr. Browning's most important achievements is his work on the Blue Ridge Parkway, the scenic motor road connecting the Shenendoah Park with the Great Smoky Mountains National Park. Since 1934 he has had general supervision of routing, surveying, and right-of-way procurements for this great project. He walked more than 10,000 miles investigating and checking location surveys on 250 miles of right-of-way.

President Merriam Addresses Massachusetts Association

A dinner meeting of the Eastern Massachusetts Association of Professional Engineers and Land Surveyors was held at the Kendall Hotel, Framington, on May 7, 1954. There were 37 members and the following guests present: Gordon E. Ainsworth of the Connecticut Valley Association of Surveyors, Henry Robinson of the Central Massachusetts Association of Surveyors, Charles White, Newell Snow, and Joslyn Whitney of Cape Cod Society of Civil Engineers and Land Surveyors, Bernard Merriam, brother of the speaker and President of the Framington Chamber of Commerce, and Orville Denison, Executive Secretary of the Framington Chamber of Commerce.

President Baird reported on the Worcester meeting of the surveyors representing various sections of the State regarding the formation of a State-wide association of surveyors. Two resolutions were reported from this meeting: one, resolved that a Massachusetts association of surveyors be formed; two, resolved that three representatives from each association, to include the presidents, meet on June 19, 1954, in Worcester, to plan a State organization. A motion was carried that this organization is in favor of becoming a member of a State-wide organization. A motion was carried that the President and two other members, appointed by him, be sent as a committee of three to assist in establishing a State-wide organization on June 19, 1954, in Worcester.

After the business meeting, the President introduced Carroll F. Merriam, President of the American Congress on Surveying and Mapping, who spoke on "New Elements in Surveying." Mr. Merriam discussed the possibilities that the modern surveyor has at his disposal in the proper utilization of modern calculating machines. He advised the surveyor to utilize analytic geometry to solve many of his problems.

As the result of the meeting in Worcester, several regional groups of Massachusetts surveyors and engineers, including the Cape Cod Society and the Eastern Massachusetts Association of Professional Engineers and Land Surveyors, were combined and organized as the Massachusetts Association of Land Surveyors and Civil Engineers. Gordon Ainsworth has been elected the first President of this new State Association, and Llewellyn T. Schofield its first Secretary.

—Brenton V. Schofield

* * *

South Carolina Society of Registered Land Surveyors

On Saturday, June 19, 1954, fifty-four land surveyors from all sections of South Carolina gathered at the Jefferson Hotel in Columbia for the purpose of organizing into a society. It was the second organizational meeting and from it was formed the South Carolina Society of Registered Land Surveyors. The object of the society is the advancement of the public welfare and professional, social, and economic interests of the Registered Land Surveyor by promotion of education, legislation, and public relations through the establishment and maintenance of high ethical standards and practices.

A constitution was adopted and the following officers were elected: President, Joseph Palmer, Sumter, S. C.; Vice President, Legare Hamilton, Georgetown, S. C.; Secretary-Treasurer, William Wingfield, Columbia, S. C.; Directors, W. B. Sykes, Manning, S. C., J. Coke Smith, Easley, S. C., Heyward M. Pickell, Greenville, S. C., William C. White, Rock Hill, S. C., and John M. Jackson, Bennettsville, S. C.

The president is to appoint all committees with the approval of the directors, so that they might begin functioning before the next meeting which is to be held next winter. All registered surveyors who could not be present were invited and urged to submit their applications for membership as soon as possible so that the entire State will be thoroughly represented.

—William Wingfield

Georgia Engineers and Surveyors Hold Outing

The Georgia Society of Professional Engineers and the Georgia Association of Registered Land Surveyors held their third combined summer outing on June 18 and 19, at Columbus, Ga. Tours to major industrial plants and other places of interest were arranged during the two-day meeting including a visit to the Little White House at Warm Springs, Ga. The summer outing was brought to a close with an enjoyable dinner and dance.

The following officers for the Georgia Association of Registered Land Surveyors were elected and installed at the outing:

Richie M. Marbury, Jr., *President*
Charles C. Hawken, *Vice President*
Thomas H. Winchester, Jr., *Secretary-Treasurer*
Thomas E. Smith, *National Representative*
Harold L. Bush, *Alt. Natl. Representative*

Directors

John K. DuBose J. Harold Smith
Thomas L. Grist A. Pope Stevens, Jr.
H. E. Watts, Jr.

—Thomas H. Winchester, Jr.

Texas Surveyors Association

A State-wide program of personal solicitation of candidate support for the proposed Public Surveyors Act was carried out by the Texas Surveyors Association during June and July in an effort to secure as many commitments as possible before the July 24 primary election. For this purpose the State was divided into seven areas of roughly equal legislative representation, each to be headed by a TSA officer or director residing in the area. Based on the experience of last year, in which it was learned that only personal contact by home district constituents carries much weight with a legislator, one or more surveyors in each voting district within each area were enlisted to do the personal contact work. Each person asked to do contact work was provided with pertinent information on candidates and a copy of the bill for each candidate. The results to date, from incomplete reports, have been gratifying, but plans are being made for following through with active participation by the membership as a whole.

Plans are being made for the Third Annual Short Course of the Texas Surveyors Association, to be held on October 12 and 13, 1954. Programs will be sent out in September after speaker acceptances and final arrangements have been made.

—William Shirriffs

Air Force Needs Cartographers and Photogrammetrists

The USAF Aeronautical Chart and Information Center produces and distributes all types of aeronautical charts and related publications that are required by the Air Force in carrying out its world-wide mission. Requirements for photogrammetrists and cartographers include both staff and line positions in the Headquarters, Aeronautical Chart and Information Center, St. Louis, Mo., and the Office of Research and Liaison of ACIC, Washington, D. C.

The principal types of work for which personnel are needed include the research and evaluation of geodetic and cartographic materials and similar data for producing charts. The work also includes photogrammetric and cartographic compilation drafting of all types of charts and publications.

Application should be made for positions in the St. Louis area to the Civilian Personnel Office, USAF Aeronautical Chart and Information Center, Second and Arsenal Streets, St. Louis 18, Mo.; in the Washington area to Civilian Personnel Office, Office of Research and Liaison, ACIC, 25th and Oklahoma Avenue, NE., Washington, D. C.

• *Notice*

Fifteenth Annual Meeting, March 1955

The coming 15th Annual Meeting of the American Congress on Surveying and Mapping, scheduled immediately following the 21st Annual Meeting of the American Society of Photogrammetry, by reason of the combined influence of two great conventions closely associated in their fields of interest, offers greater attendance impact and appeal to the membership than any previous meeting. As the 1955 ASP-ACSM Consecutive Meetings, both the ASP and the ACSM separate annual meetings are scheduled consecutively during the single week of March 6–12, 1955, together with a mammoth Co-Exhibit, in the spacious convention and exposition halls of the Shoreham Hotel in Washington, D. C.

Officers and committees of both societies are in full swing developing outstanding programs worthy of the individual and overlapping interests of both memberships, in keeping with expected extraordinary attendance at both meetings and the week-long display of exhibits.

Programs are being designed with careful consideration to the overlap of interest in fields and membership of both societies. Particular effort is being made to plan each day's program attuned in overlap of interest to preceding or following day, to afford every possible advantage in program continuity should it be necessary for travellers to select certain days for attendance.

A single registration is planned for the 1955 ASP-ACSM Consecutive Meetings for attendance to all or any of the ASP 21st Annual Meeting or the ACSM 15th Annual Meeting sessions.

Entertainment and social affairs of ASP and ACSM will be enjoyed together as programmed co-functions.

Exhibits will be on display from Monday noon, March 7th through Friday noon, March 11th. The combined exhibits of leading companies from all parts of the world, and the displays by governmental mapping agencies from the United States, are features not to be missed. Convention experts by conservative estimate expect three to four thousands of people to view this exhibit. Of particular added interest to ACSM Regular Annual Meeting attenders, will be the photogrammetric equipment displays and demonstrations. To those not yet having had opportunity to examine such machines and devices and to mingle with the experts in those fields, this feature itself could well be a major highlight of your attendance.

Chairman John Cain of ASP 21st and Chairman Walt Dix of ACSM 15th, with wise counsel and advice from General Coordinator Marshall S. Wright, Sr., and his advisors, are working toward early issuance of program information.

Meanwhile, early reports from Program and Exhibits Committees indicate that no one can afford to miss the next March Annual Meetings——

the ASP sessions March 7, 8, and morning of the 9th——

the ACSM sessions from noon on March 9th through March 10, 11, 1955.

Remember Those Dates • Lucky 7–11 March • Plan Your Reservations Now

WALTER S. DIX, *Chairman*
ACSM 15th Annual Meeting

CONGRESS NEWS

Resolutions Adopted at Fourteenth Annual Meeting

(EDITOR'S NOTE.—In the report of the 14th annual business meeting beginning on page 238 of the April–June 1954 issue of the Journal, are printed some of the resolutions presented at that meeting. For others, the approved text was not available at the time of going to press. Printed below are the approved texts of the first two. It will be noted that the titles have been changed.)

RESOLUTION ON COORDINATION OF HIGHWAY SURVEYS WITH THE ESTABLISHED NETWORK OF GROUND CONTROL SURVEYS FOR EXTENSION OF THEIR PUBLIC USEFULNESS AND THEIR PERPETUATION

Whereas, the American Congress on Surveying and Mapping recognizes the need for both coordination and perpetuation of surveys to save public and private funds, and realizes the large economic loss and wastefulness in uncorrelated effort and the inconveniences that occur when one-purpose property or engineering surveys are made on the ground without closure and standardization of their accuracy, without monumentation for their preservation, and without being tied to and coordinated with the established network of horizontal and vertical ground control surveys for utilization by all others who subsequently require and will make surveys within the same or nearby areas; and

Whereas, the U. S. Coast and Geodetic Survey has established a system of plane coordinates for each of the respective States of the United States, and has determined the plane coordinate position of each ground control survey point now a part of the established network of control surveys;

Whereas, extension of the network by establishment of additional ground control survey points of practical value and close proximity to all parcels of property and engineering works is needed for use by local jurisdictional divisions of municipalities, counties, and States, and for use by professional surveyors and engineers;

Whereas, funds for the establishment of such survey points by the U. S. Coast and Geodetic Survey have not been sufficient to keep pace with needs; and

Whereas, the preliminary and location surveys made by highway engineers in their location, construction, revision, and extension of the systems of highways within each State and throughout the United States are of the magnitude, and may be economically made in the detail and to the precision necessary for local extension of the established network of ground control surveys, and for the further coordination, perpetuation, and local closure of this network to better fulfill the current and ever increasing need for more ground control surveys; now, therefore, be it

Resolved, that the Commissioner, Bureau of Public Roads, United States Department of Commerce, be requested to specify that all preliminary and location surveys for highways made hereafter under his direction shall be made to third order or a higher order of accuracy and shall be fully tied to the ground survey points, wherever reasonably accessible, in the presently established and respectively applicable system of State plane coordinates;

That the Commissioner of Public Roads be asked to recommend and encourage similar action by all State highway administrators and officials on each and every highway surveyed by the States; and, to further accomplish the afore-mentioned purposes and to work toward attainment of the mutually beneficial objectives;

That the highway department or commission of each State be urged to direct that all preliminary and location surveys by its highway engineers and financed by its funds shall be made with requisite accuracy, and shall be fully tied to the applicable system of State plane coordinates;

That the various associations of State highway officials be urged to adopt the policy that all preliminary and location surveys for highways shall be made to prescribed accuracies and wherever feasibly possible shall be tied to and closed on the most accessible survey points of the established and applicable State plane coordinate system;

That the Bureau of Public Roads and the States be requested to set survey station markers and bench marks at one-mile or smaller intervals at such places along each highway surveyed and

constructed in the future, with full identification and guard and reference post markings, and in such manner that their survey position and the whole highway survey will be permanently preserved;

That the United States Coast and Geodetic Survey in its control surveying be urged to make adequate ties to the station markers and bench marks of all highway surveys, reasonably available, for all of such surveys which have preceded extension of the network of ground control survey; and, be it further

Resolved, that all Federal, State and county highway departments and commissions, and all local authorities, officials, engineers, and registered surveyors be requested to consult with the United States Coast and Geodetic Survey on ground control survey matters, especially about the location of established ground control survey points and about methods and procedures of accomplishing in the most economical and reliable manner the mutually beneficial objectives set forth in this resolution.

RESOLUTION ON PRESERVATION OF SURVEY MONUMENTS ALREADY ESTABLISHED

Whereas, the American Congress on Surveying and Mapping recognizes the great present and future value of the network of horizontal and vertical survey control monuments established by the Federal and local governments, and

Whereas, the American Congress on Surveying and Mapping realizes that an educational program on the preservation of survey monuments has been quite successful in recent years, but that despite this program and the efforts of local engineers and surveyors many survey monuments are still destroyed each year, by highway grading and construction programs; now, therefore, be it

Resolved, that the Commissioner, Bureau of Public Roads, United States Department of Commerce, be requested to appraise the highway departments in each State of the gravity of this situation, expressing the appreciation of the American Congress on Surveying and Mapping of their past efforts in the preservation of survey monuments, but urging these agencies to take steps to preserve the monuments which are in danger of destruction because of highway improvement programs, and expressing the hope that they may make even greater efforts in the future toward preservation and relocation of survey monuments by instructing the grading and construction personnel, informing them as to their locations and impressing them with the fact that, whereas the cost of establishing these monuments may vary from 100 to 1,000 dollars, the value is far in excess of these amounts.

Northern California Section Conducts Varied Activities

Three meetings within a period of six weeks featured the spring activities of the Northern California Section, ACSM. A wide range of themes was covered by these activities, as outlined below.

Property Surveys.—The Property Surveys Division of the Section held a meeting on May 14 at City College of San Francisco. Jack Y. Long of J. Y. Long Company, Engineers, Oakland, was the guest speaker of the evening. The subjects covered by Mr. Long were (1) The California Council of Civil Engineers and Land Surveyors, and (2) Opportunities for Students in Civil Engineering and Land Surveying. Discussions of these topics were entered into by members and guests present at the meeting. The film, "Property Lines," was shown by Mr. Long and this proved to be a worth-while and very interesting presentation.

Licensing for Photogrammetric Mapping.—The Section held a meeting on the night of June 11, 1954, in the Mirror Room of the Sacramento Hotel, Sacramento, Calif.

A panel discussion was held by four well qualified speakers on the subject: "Should Licensing as a Civil Engineer or Land Surveyor be Required When Topographic Maps are Prepared with the Aid of Photogrammetric Methods?"

The panel members were: Charles O. Greenwood, Jr., Civil Engineer; Edwin W. Brunton, Land Surveyor; George P. Katibah, Photogrammetric Engineer; and Tracy L. Atherton, Civil Engineer.

After a spirited discussion of the topic by the panel members, the meeting was opened to all present for general comments and debate.

Control Surveys Field Night.—Field demonstrations, equipment displays, and technical papers comprised the program of the Field Night of Control Surveys held by the Section at Westlake Junior High School, Oakland, Calif., on June 25, 1954.

Demonstrations of precise leveling, invar taping, and angular observations were conducted on the school playground by representatives of the

City of Richmond (Roy Nakadegawa), the City of Oakland (W. T. Daily), and the Contra Costa County Surveyor's Office (Al Milano), respectively. Commentary was offered by J. R. Godman, East Bay Municipal Utility District.

Exhibitors and equipment displayed were as follows: A. Lietz Company—Watts instruments; City of Oakland—taping equipment; East Bay Blue Print Company—K&E instruments; Motorola, Inc.—portable radio equipment; Rutico, Inc.—Kern instruments; and Surveyors Service Co.—Wild instruments.

The program of technical papers was presented in the school auditorium. W. O. Sarlin, of the Corps of Engineers, spoke on "Office Computations." T. L. Atherton, of the State Engineer's Office, discussed "Obtaining Data of Existing Control," and F. H. Moffit, of the University of California, described "The California Coordinate System."

—HARLEY A. WATERFALL
Section Editor

❦ ❦ ❦

Texas Section

The thirteenth meeting of the Texas Section of ACSM was held May 20, 1954, in the Hospitality House of the Houston National Gas Company, with W. H. Wilson, Chairman, presiding.

ALVIS VANDYGRIFF ADDRESSING THE 13TH MEETING OF THE TEXAS SECTION

Forty-four members and fifteen visitors were present.

The treasurer's report was read by Leonard Cornitius, showing a balance of $653.51. Chairman Wilson gave an interesting account of the Fourteenth Annual Meeting of ACSM held at Washington, D. C., on March 22, 23, and 24, 1954. Those attending the meeting from the Texas Section were: J. S. Boyles, E. D. Morse, R. L. Sargent, Roy Streikert, W. H. Wilson, L. V. Norris, and Mr. Tettley from Beaumont.

V. A. Walston, program chairman, introduced the principal speaker of the evening, Alvis Vandygriff. Mr. Vandygriff discussed the Proposed Registered Public Surveyors Act of 1955 by explaining the purposes and meaning of the redrafted bill. C. E. Buehner, Manager of Houston's Better Business Bureau, expressed hope for its early passage mentioning that his office was continually swamped with telephone calls from irate property owners whose property had been surveyed by unqualified surveyors, resulting in the moving of fences, garages, and even houses due to the mis-location of property lines. Carl

CARL STIMSON ASKS A QUESTION FROM THE FLOOR AT THE 13TH MEETING OF THE TEXAS SECTION

Stimson inquired as to whether the bill would eliminate the unqualified surveyor. Mr. Vandygriff explained that in order for anyone to practice surveying they would have to qualify themselves under the proposed bill.

—KENNETH E. BRITAIN
Secretary

Louisiana Section Organized

The Louisiana Section of ACSM was formed at an organization meeting held at the New Orleans Engineers' Club, DeSoto Hotel, New Orleans, on June 28, 1954.

After a social hour, J. S. Toler called the meeting to order and introduced Lester C. Higbee, representing ACSM. Mr. Higbee read an official ACSM letter authorizing him to:

1. Process memberships under Articles II, III, and IV of the ACSM Constitution as may be required to expedite qualification under membership requirement (at least 15 members).

2. Act for Executive Secretary Dix in accepting a petition for forming a Louisiana Section, ACSM.

3. Act for President Merriam under the ACSM Constitutional provisions in Section IV, to appoint a temporary Chairman of the meeting.

Mr. Higbee then received a list of 21 new members and the following petition, signed by 15 previous and the 21 new members:

We, the undersigned, after due and thoughtful consideration, desire to increase the effectiveness of our membership in ACSM by forming a Louisiana Section to include those members of ACSM who reside in the State of Louisiana, U. S. A., in accordance with the provisions of Section IV of the ACSM Constitution.

Mr. Higbee, finding the petition in order, declared the Louisiana Section duly formed, and appointed Mr. Toler as its temporary Chairman. After reading a paper prepared by President Merriam, Mr. Higbee then discussed the history, objectives, and extent of membership of ACSM and the plans for the next Annual Meeting.

Mr. Toler then introduced Daniel Kennedy of the U. S. Geological Survey, Past-President of the Washington, D. C., Section; G. W. Herzog of the Shell Oil Company, Past-Chairman of the Texas Section; and Commander Earle of the U. S. Coast and Geodetic Survey, each of whom made appropriate remarks.

Mr. Toler outlined the work of the group in preparation for organization of the Section, and called upon Stanley P. Chapman for a report of the temporary By-Laws Committee. Copies of the proposed by-laws were distributed, discussed, and adopted, subject to approval of the Board of Direction, ACSM.

Martin Standard presented the slate of officers proposed by the temporary Nominating Committee, and the following were elected by unanimous vote, and installed as officers of the Section:

Stanley Chapman, *Chairman*
Jack Toler, *First Vice Chairman*
T. Baker Smith, *Second Vice Chairman*
Reginald McC. Schmidt, *Third Vice Chairman*
George E. Jones, *Secretary*
George Mott, *Treasurer*

Directors

A. L. Brawley — Hadley N. Harrison
Murray Cunningham — W. L. Manning
E. M. Sanders

Chairman Chapman took the chair and asked the cooperation of all in making the newly formed Section a success.

—George E. Jones
Secretary

New Local Section Being Organized in Denver

An informal meeting of persons interested in the formation of a local section of the ACSM was held in Denver, August 13, 1954, with 75 present. The group was called to order by Acting Chairman J. E. Mundine of the Topographic Division who announced that the ACSM had authorized a local section in the Denver area. Copies of a letter of greeting from Carroll F. Merriam, President of the ACSM, were distributed at the door.

Mr. Mundine introduced Gerald FitzGerald, Chief Topographic Engineer of the U. S. Geological Survey, a past President of the ACSM, who had been selected by President Merriam as his personal representative at the meeting. Mr. FitzGerald briefly outlined the purposes and objectives of the Congress.

Mr. Mundine expressed appreciation of Mr. FitzGerald's message from the Congress and proceeded to appoint a nominating committee for the selection of candidates for officers of the new section. The next meeting will be held September 13, for the purpose of electing officers, approving a Charter and By-Laws, and choosing an appropriate name for the local section.

—L. M. Stevenson
Acting Secretary

Topography Division Board Meets

A meeting of the Board of Direction of the Topography Division was held on July 10, 1954, at the office of Chairman Earle J. Fennell in Washington, D. C. Members of the committee present were Earle J. Fennell, C. W. Buckey, and L. E. Marsden. C. S. Maltby, Past Chairman of the Division, and W. S. Dix, Executive Secretary of ACSM, attended as guests.

Topics discussed were the organization of the Division, selection of officers, and a tentative schedule of Division activities.

The statement of the Northern California Section on professional policy, as published in the April–June number of SURVEYING AND MAPPING, was reviewed. It was agreed that the issue bears vitally upon the interests of the Topography Division and that the Division should participate actively in the disscussions and exchange of views which must necessarily precede reaching a consensus.

Subsequent to the time of the Board meeting, the Chairman invited the following people to serve as chairmen of Division committees or other offices, and the invitations have been accepted:

William B. Overstreet, *Program Committee*
Harold R. Brooks, *Publications Committee*
Benjamin Munroe, Jr., *Membership Committee*
John B. Rowland, *Secretary-Treasurer*

—EARLE J. FENNELL

Florida, Massachusetts, and Wisconsin Affiliates

Petitions of three organizations for affiliation with ACSM were accepted by the Board of Direction at a meeting following the Fourteenth Annual Meeting of ACSM, March 24, 1954. Effective as of that date, the new affiliates are:

The Surveying and Mapping Section of the Florida Engineering Society;

The Eastern Massachusetts Association of Professional Engineers and Land Surveyors;

The Wisconsin Society of Surveyors.

Personals

Clifford A. Thorpe, Jr., Secretary of the Instruments Division of ACSM since 1951, recently formed an organization specializing in repairing, selling, and renting surveying instruments. This firm, located at 308 S. Washington St., Falls Church, Va., under the name of Thorpe-Smith, Inc., is expected to be the largest in the Virginia-Carolina area and one of the largest east of the Mississippi. It will be the local distributor for C. L. Berger & Sons, Inc., for which Mr. Thorpe served as field engineer for the past 5 years.

Leo J. Zuber has been elected President of the Atlanta Section, American Institute of Planners, for 1954–55. Mr. Zuber, a member of ACSM, is the author of "What's a Map Worth" which appeared in the Jan.–Mar. 1952 issue of SURVEYING AND MAPPING. Some program activity by the Atlanta Section, AIP, will relate to the progress of topographic mapping in metropolitan Atlanta and elsewhere in Georgia.

James Harold (Red) Lymburner, well known aviation executive, has been named Sales Manager of Canadian Aero Service Limited, the company announced today.

Lymburner brings a broad background of flying and sales experience to his new post. A

bush pilot in the great Canadian tradition, his flying career started 26 years ago. He has flown over many remote areas in Canada, and he was Chief Pilot for the two Ellsworth expeditions to the Antarctic in the Thirties. During World War II he was Chief Test Pilot for Fairchild Aircraft Limited, and he holds an Honorary Group Captaincy, R.C.A.F.

Lymburner will direct the sales effort of Canadian Aero Service Limited, which is engaged in airborne magnetometer surveys for oil and minerals, scintillation counter surveys, and aerial topographic mapping. The company is affiliated with Spartan Air Services Limited, Ottawa, who fly Canada's largest air survey fleet.

Capt. Albert J Hoskinson of the Division of Geodesy, U. S. Coast and Geodetic Survey, who is chairman of the Control Surveys Division of ACSM has been named by President Merriam to represent ACSM at the meeting of the International Union of Geodesy and Geophysics to be held in Rome, September 15 to 29, 1954. Capt. Hoskinson will extend greetings and wishes for a successful meeting from ACSM as specified by a resolution adopted at the Fourteenth Annual Meeting of ACSM.

* * *

Obituaries

ANDREW F. W. McNALLY

Andrew F. W. McNally, chairman of the board of Rand McNally & Company, died in Chicago, Ill., on May 20, at the age of 67. He had been ill only a short time.

Born in Chicago, Mr. McNally was the son of Frederick McNally and the grandson of Andrew McNally, a founder in 1856 of the Rand McNally map-making and printing firm.

Mr. McNally had been associated with the company since 1907. He became its president in 1932 and was named chairman of the board in 1948. At that time, one of his sons, Andrew III, of Chicago, replaced him as president.

Mr. McNally had homes in Chicago, Thousand Islands, N. Y., and Pasadena, Calif.

Surviving are his widow, Eleanor; two other sons, Ward of Chicago and Frederick of New York City; and a daughter, Mrs. Eleanor Bodman.

THOMAS P. PENDLETON

Thomas P. Pendleton, former chief topographic engineer of the Geological Survey, died on May 28, 1954, at his home in Bethesda, Md., after a long illness.

Born in Nicolaus, Calif., Mr. Pendleton joined the Survey in 1905 as a rodman after he graduated from the University of California. From 1909 to 1917, he mapped many areas in the western United States.

In 1918, he was commissioned in the United States Army Engineers and worked on the development of aerial photographic techniques, including the 3-lens mapping camera. After the war, he rejoined the Survey and used the panoramic camera to map a part of Mount McKinley National Park in Alaska for the Geological Survey.

In 1920 he was furloughed for a special mapping assignment in Turkey and on his return was appointed the first chief of the newly-formed Section of Photo-mapping in the Survey. A year later he took leave again to do work in Palestine and the Balkan states.

From 1926 to 1934, he was chief engineer for private mapping firms in Philadelphia and New York. In 1934 he rejoined the Survey and directed a Tennessee Valley Authority mapping project on which about 500 engineers were employed. Later he directed tests which resulted in the improvement of the multiplex, an instrument for the projection of aerial photographs in mapmaking which is in wide use today.

He was made chief topographic engineer of

the Survey in 1943. A year after his retirement he was awarded one of the first gold medals given by the Interior Department for distinguished service.

Mr. Pendleton was a member of the American Society of Civil Engineers, The American Geographical Society, the American Society of Photogrammetry, the Canadian Institute of Surveying, the Washington Academy of Sciences, the American Congress on Surveying and Mapping, the American Legion, the Masonic Lodge of Arbuckle, Calif., the Explorers Club, the Cosmos Club, and Tau Beta Phi.

In 1942, Mr. Pendleton served as President of the American Society of Photogrammetry and was subsequently elected an Honorary Member of the organization.

He was the author of numerous technical articles on mapping and in 1944 represented the United States at a Pan American conference on geography and cartography in Rio de Janeiro, Brazil.

Survivors are his widow, the former Florence H. Beel; a son, Thomas A. Pendleton, of Chevy Chase; a sister, Miss Hazel Pendleton, of Sacramento, Calif.; and a granddaughter.

KEITH ROBERTS

Keith Roberts, a Wisconsin member of ACSM, died March 16, 1954, at Asheville, N. C., where he was vacationing.

Born in Chicago, Ill., on August 31, 1889, Mr. Roberts was graduated from the Colorado College of Mines with a degree of Engineer of Mines. After graduation, he served as mining engineer in California and Montana and on oil field development work in Kansas. He was also manager of gold mines in Alaska. During World War I, he served as ensign in the Navy.

For ten years, Mr. Roberts was secretary-treasurer of the Charles H. Roberts Co., consulting municipal engineers of Chicago. During World War II he returned to Alaska as resident engineer for CAA, and was field agent for the land division of Alaska Native Service in 1945–46. He served the past seven years as a surveyor and for four years was County Surveyor of Menominee County, Mich.

Besides ACSM, Mr. Roberts was a member of the Masonic Lodge, American Institute of Mining Engineers, Michigan Society of Registered Land Surveyors, Wisconsin Society of Land Surveyors, Rotary, and Adventurers Club of Chicago. He was also active in Boy Scout work.

Mr. Roberts is survived by his wife and three children.

❦ ❦ ❦

Michael Baker, Jr., Wins Honors

ACSM member Michael Baker, Jr., has been appointed to the Pennsylvania State Board for the Registration of Professional Engineers. Head of the engineering firm bearing his name, of Rochester, Pa., Mr. Baker was one of the 10 winners of the 1954 Horatio Alger awards, an honor given for achievement to men whose careers best typify the American rise to the top from humble beginnings by earnest and honest effort—and faith, vision, and humility. The latter points are brought out vividly in Mr. Baker's story "This Is My Formula for Success" printed in the July 18, 1954, issue of *Parade*, the Sunday newspaper supplement picture magazine, in which he says, "If I could give the youth of America some legacy to help them find real success in the years ahead, I would give them a full measure of faith and humility." Congratulations, Michael Baker, Jr.; ACSM is proud of you.

—Walter S. Dix

NEW MEMBERS

INDIVIDUAL MEMBERSHIPS

ALEXANDER, Mrs. Jeanne R., 1426 21st St., NW., Washington, D. C.—Cartographic Compilation Aid, U. S. Geological Survey

ANDERSON, W. Joseph, 532 9th St., NE., Washington 2, D. C.—Chief, Property Maintenance Section, U. S. Geological Survey

ASHLEY, Arthur N., 369 Foch Blvd., Mineola, N. Y. —Student, New York State College of Forestry

BAKER, John F., 415 W. First St., Fort Worth, Tex. —Partner, Brookes Baker, Surveyors

BALDWIN, Ernest G., 2150 Branch Ave., SE., Washington 20, D. C.—Cartographer, Navy Hydrographic Office

BALLING, Louis J., 2903 Dunglow Rd., Dundalk, Md.—Surveyor, Maryland Airphoto Corp.

BARRON, Chandler H., 21 Longfellow St., Portland 5, Maine—Civil Engineer and Surveyor

BARTOO, Donald G., 436 Royal Palm Way, Palm Beach, Fla.—Civil Engineer and Surveyor

BECKER, Samuel, 4317 Russell Ave., Los Angeles, Calif.—Surveyor, C. W. Cook Co.

BELCHER, C. B., Grundy, Va.—Land Surveyor and Mining Engineer

BENSON, Harry F., 406 Park Circle, Elkton, Md.—Land Surveyor, Harry F. Benson, Surveyors

BENTZ, A. H., S. 514 Hemlock St., Spokane, Wash. —Surveyor

BENZING, Sam, Jr., Court House, Grand Rapids, Mich.—Itasco County Surveyor

BESSOR, Phil, P. O. Box 114, Bellevue, Wash.—Land Surveyor

BIDDULPH, William C., 1410 E. Alabama St., Houston, Tex.—Junior Surveyor, Shell Oil Co.

BIRDWELL, Robert H., 2510 South Blvd., Houston, Tex.—Geophysicist and Geologist, Petroleum Development Associates

BLOUNT, William J., 206 E. Home St., Long Beach, Calif.—Draftsman, Richfield Oil Corp.

BOENKER, Alvin C., 4935 Culmore Dr., Houston, Tex.—Draftsman, Tennessee Gas Co.

BOWEN, Herman L., 12163 Morning Ave., Downey, Calif.—Head, Survey Division, Los Angeles County Flood Control Project

BRAMHALL, Eugene A., 11 E. Northampton Court, Amsterdam, N. Y.—Survey Party Chief, F. R. Harris, Inc.

BRAY, Jack, c/o IAGS, Fort Clayton, Canal Zone—Cartographer

BROWN, Albert H., Jr., Southern Railway Bldg., 15th and K St., NW, Washington, D. C.—Asst. Engineer, Southern Railway Co.

BROWN, James H., P. O. Box 185, Artesia, N. Mex. —Surveyor

BRUNSON, Edmund G., Liberian Cartographic Service, Monrovia, Liberia—Photogrammetrist

BURZYCKI, Lt. Richard S., 581 A. B. Sqdn., Box 498, APO 74, c/o Postmaster, San Francisco, Calif.

BUSH, William, Belle Mead, N. J.—Surveyor

CALVERT, DeWitt C., 2248 Gerber Ave., Sacramento, Calif.—Surveyor, Muir and Train Co.

CANGER, Michael A., Jr., 2515 Fair Lawn Ave., Fair Lawn, N. J.—Canger, Bailey and Associates, Civil Engineers and Surveyors

CARLIN, James R., 14 Roosevelt Ave., Beverly, Mass.—Junior Civil Engineer, County of Essex

CARTWRIGHT, Richardson B., Chesapeake Corporation of Virginia, West Point, Va.—Surveyor

CHAMPION, D. F., 410 Drew St., Houston, Tex.—Party Chief, Stanolind Oil and Gas Co.

CHANDLER, R. L., 805 Westridge Dr., Newton, Kans.—City Engineer

CHRISTENSEN, Alfred, 13439 Blossom Ave., Apt. 5-B, Flushing 55, N. Y.—Estimator, Walter Kidde Constructors, Engineers and Builders

COLSON, George P., Box 328, Amman, Jordan—Field Engineer, Michael Baker, Jr., Inc.

COOK, Wesson, 8718 23rd Ave., Hyattsville, Md.—Planning Engineer, Maryland National Capital Park and Planning Commission

COOK, William B., 928 Rood Ave., Del Paso Heights, Calif.—Cartographer, U. S. Geological Survey

COPELAND, Fred E., 1519 N. Buchanan St., Arlington 5, Va.—Geodetic Engineer, U. S. Geological Survey

COSTELLO, Dr. Robert R., Keuffel and Esser Co., Adams and Third Sts., Hoboken, N. J.—Sales Engineer

CRAWFORD, Augustine J., 54 Conant St., Danvers, Mass.—Civil Engineer, Assistant County Engineer

DAMON, H. Gilroy, Jr., 155 Plymouth Rd., Springfield, Pa.—Civil Engineer, Damon and Foster

DAVIS, Alex. L., 300 Pioneer American Life Bldg., Houston, Tex.—Party Chief, Stickle-Thompson Co.

DeLAMATER, Dean C., 322 N. Bailey St., Cheboygan, Mich.—Forestry Surveyor, Michigan Dept. of Conservation

DELANO, Joseph, Court and Russell Sts., Plymouth, Mass.—Surveyor, Delano and Keith

DINGWALL, Douglas, 66 Dudley St., Presque Isle, Maine—Supt., Presque Isle Sewer District

DRAGESEVICH, John A., 1017 Atlantic Ave., Waukegan, Ill.—Highway Engineer

DURHAM, Jean H., c/o Robert H. Ray Co., 2500 Bolsover Rd., Houston, Tex.—Asst. Chief Draftsman, Robert H. Ray Co.

EARLE, Thomas B., 600 Pennsylvania Ave., Savannah, Ga.—Civil Engineer, Corps of Engineers, U. S. Army

EARNEST, Laurence H., Jr., 4546 Elm St., Bellaire, Tex.—Surveyor, City of Houston

EIDE, James A., Route 2, Box 286-B, Cedarburg, Wis.—Ozaukee County Surveyor; Partner, Badger Surveying Co.

ELIAN, Lt. Arthur J., 31 Summer St., Claremont, N. H.—Corps of Engineers, U. S. Army

ERICKSON, James R., 3 Alan O'Kell Pl., Cranford, N. J.—Asst. Chief of Survey, Edwards, Kelcey and Beck, Consulting Engineers

EVANS, Walter F., Guilford-Savage Rd., Jessup, Md —Civil Engineer, B&O Railroad

EVERETT, Harlo G., 940 Main St., Jacksonville, Fla.—Asst. Engineer, City Engineer's Office

EWING, Donald, 627 Multnomah County Court House, Portland 4, Oreg.—Chief Deputy County Surveyor

FARRAR, Raleigh J., P. O. Box 2359, Ketchikan, Alaska—Supt. of Construction, Bureau of Public Roads

FEINGOLD, Morton, 1207 N. Orange Grove Ave., Los Angeles 46, Calif.—Civil Engineer, Los Angeles Dept. of Water and Power

FLOWERS, A. O., Arkansas State Highway Dept., Heber Springs, Ark.

FOSTER, W. Keith, Rumford Falls Power Co., 49 Congress St., Rumford, Maine

FREDRICK, Joseph F., 3611 Erby St., Houston, Tex.—Surveyor, City of Houston

FREEMAN, Douglas, Jr., 603 Walter Way, Americus, Ga.—Project Engineer, State Highway of Georgia

FUGE, Karl W., P. O. Box 87, Fort Atkinson, Wis.—Civil Engineer, Karl W. Fuge and Associates

GAMA, George, 1909 Virginia St., Bakersfield, Calif. —Chief of Party, Kern County Land Co.

GARNETT, Mark W., 418 E. 275th St., Euclid, Ohio —Surveyor and Field Engineer, Frank A. Thomas and Associates

GASPERETTI, John, Post Box 69, Kuwait, Persian Gulf—Chief of Surveys, American Independent Oil Co.

GELLER, William C., 1402 Wilbur St., Dallas, Tex. —Photogrammetrist, Sinclair Oil and Gas Co., Fort Worth, Tex.

GOLZ, Walter, Enderlin, N. Dak.—Farmer, landowner

GOORWITCH, Albert, 155 W. Pennington St., Tucson, Ariz.—Chief Draftsman, Blanton and Cole

GOSTIN, Sommers J., 1111 Bankers Insurance Bldg., Macon, Ga.—Vice President, Winchester Engineering Co.

GOUDEAU, M. J., Jr., 168 W. Bellevue St., Opelousas, La.—Civil Engineer and Surveyor

GREER, Robert C., Jr, Sun Pipe Line Co., 1608 Walnut St., Philadelphia 3, Pa.—Project Engineer

GRIDLEY, John F., Apt. No. 2, 14 Cardington Rd., Dayton, Ohio—Surveyor in Training, H. R. McClure Engineering Co.

HAGESTAD, Herman T., River Falls, Wis.—Consulting Engineer

HAHN, Hans, P. O. Box 893, Caracas, Venezuela—Cartographer, Engineer

HAHN, William R., 4269 Steffens St., Waterford, Mich.—Surveyor

HALL, Edward, III, 160 South St., Annapolis, Md. —Edward Hall, III, and Associates

HAMILTON, Jack R., P. O. Box 1761, Orcutt, Calif. —Surveyor
HAMPTON, Ernest L., 1718 Elm St., Wyandotte, Mich.—Supt. of Engineering, Pennsylvania Salt Mfg. Co.
HARGUS, William D., 502 West H St., Brawley, Calif.—Surveyor
HARKNESS, Ralph C., P. O. Box 1012, Eureka, Calif.—Advance Planning Engineer, Div. of Highways, State of California
HARMON, Charles E., 600 Tobac Ave., Philadelphia 11, Pa.
HARRIS, Leon W., 5518 Aspen St., Houston, Tex.—District Engineer, Phillips Petroleum Co.
HART, William C., 1210 E. Colonial Dr., Orlando, Fla.—Surveyor, Owner W. C. Hart and Associates
HARTIS, Capt. John F., C. E. Department, Virginia Military Institute, Lexington, Va.—Teacher
HATCH, Frederic B., 602 Preble St., Cape Elizabeth, Maine—Civil Engineer
HATCHER, Maj. William E., Jr., 4301 Tyrolean St., St. Louis 16, Mo.—Liaison Officer, AMS and ACIC
HAYES, J. Benjamin, 9818 Roosevelt Way, Seattle 55, Wash.
HEADRICK, William E., 111 Rice St., Little Rock, Ark.—Engineer, Arkansas State Highway Dept.
HEISKANEN, Dr. Weikko A., 645 E. Beechwold Blvd., Columbus, Ohio—Director, Institute of Geodesy, Photogrammetry and Cartography, Ohio State University
HOGAN, Richard S., Apt. Lower South, 800 S. Merengo Ave., Pasadena, Calif.—Field Engineer and Photogrammetrist, Hycon Aerial Surveys
HOLLETT, Grant T., 504 Spruce St., Ishpeming, Mich.—Chief Engineer, Cleveland Cliffs Iron Co.
HOPKINS, Barton, 2112 W. Canton St., Long Beach, Calif.—Senior Delineator, California Division of Highways
HORN, George H., 5425 3rd Ave., Los Angeles 43, Calif.—Surveyor, City of Los Angeles
HOUTMAN, G. D., 112 W. Front St., Media, Pa.—Professional Engineer, Partner, G. D. Houtman and Son
HOWELL, Robert L., P. O. Box 1798, Denver, Colo. —Civil Engineer and Land Surveyor, Sun Oil Co.
HUGHES, Stephen V., Jr., Room 802, 441 Stuart St., Boston 16, Mass.—Civil Engineer, New England Power Service Co.
HUNT, James N., 1723 G St., NW., Washington, D. C.—Cartographer, U. S. Geological Survey
HUTCHINS, E. J., Jr., Sun Oil Co., P. O. Box 2831, Beaumont, Tex.—Civil Engineer
HUTCHINSON, J. A., P. O. Box 231, San Bernardino, Calif.—District Locating Engineer, California Division of Highways
JACKMAN, Lawrence E., 1302 King Ave., Columbus, Ohio—Surveyor, Jennings-Lawrence Co.
JAGOW, Robert J., 114 N. First St., Ann Arbor, Mich.—Atwell-Hicks, Inc.
JOHNSON, Harold L., 18839 E. Leadora Ave., Glendora, Calif.—Vice President, Karl F. Tuttle Engineering Co., Inc.
JOHNSTON, David W., 607 22nd St., NW., Washington 7, D. C.—Cartographer, Army Map Service
JONES, Bob, Route 2, Box 2187, Bellevue, Wash.
JONES, Lt. Comdr. Emerson E., U. S. Coast and Geodetic Survey, Washington, D. C.—Hydrographic and Geodetic Engineer
KEEFE, Charles B., 46½ Center St., Rutland, Vt.—Owner, Charles Boardman Keefe, Engineering Surveys
KELLEY, Robert W., 630 Federal Bldg., Detroit, Mich.—Cartographer, U. S. Lake Survey
KESTNER, Joseph A., Jr., 189 N. Lake Ave., Troy, N. Y.—Civil Engineer, Barker and Wheeler, Engineers
KIRCHNER, Charles R., R. D. No. 2, Columbia, Pa.
KIRKLAND, E. H., 506 Hermann Bldg., Houston, Tex.—Owner, Kirkland Engineering Co.
KLAASSE, James M., c/o W. and L. E. Gurley, Fulton St., Troy, N. Y.—Sales Manager, Industrial Division
KOKA, Nicholas C., 1509 Crest Rd., Silver Spring, Md.—Cartographer, U. S. Coast and Geodetic Survey
KORNMAYER, T. J., Jr., 5131 Hull St., Houston, Tex.—G.G.I. Draftsman, Union Sulphur and Oil Corp.
KRAFT, Richard H., 515 Welch Blvd., Flint, Mich. —Civil Engineer, West Engineering Co.
KRAUS, Virgil K., 2711 Chenevert St., Houston, Tex.—Map Draftsman, Brazos Oil and Gas Co.
LANE, William R., 5304 20th St., N., Arlington, Va. —Civil Engineer, Army Map Service
LEISURE, Clifford, 1109 River Dr., Hammond, Ind. —Works Engineer, E. I. duPont de Nemours Co.
LEVINE, Isaac, 18 Church St., Paterson, N. J.—Civil Engineer and Land Surveyor
LIGHT, John H., 12104 Goodhill Rd., Wheaton, Md. —Civil Engineer, Dept. of Public Works, Montgomery County
McDERMOTT, Robert G., 9219 W. Pico Blvd., Los Angeles 35, Calif.—Office Manager, Jennings Engineering Co.
McLURE, John W., Jr., 323 South St., Union, S. C. —Land and Topographical Surveyor
McMAHON, Thomas E., 311 S. McLean St., Butler, Pa.—Member, Greenough, McMahon and Greenough, Inc.
MEHDEN, H. E., 1200 E. 40th Pl., Los Angeles, Calif.—Engineering Service Corp.
MILES, E. Paul, 4429 Burlington Pl., NW., Washington 16, D. C.—Engineer-Surveyor, Potomac Electric Power Co.
MILLER, T. O., Box 496, Coeur d'Alene, Idaho—Resident Engineer, Idaho Dept. of Highways
MONROE, Benjamin H., 2722 Colston Dr., Chevy Chase 15, Md.
MONTELL, Joseph, E. 202 S. 6th St., Grangeville, Idaho—Abstracter, Inland Abstract Co.
MOORE, J. Wayne, Jr., 214½ W. Cambridge Ave., College Park, Ga.—Registered Engineer
MORGAN, Davis S., 134 Harris Dr., East Point, Ga.
MORRIS, Carl T., Box 1731, Shreveport, La.—Asst. Chief Civil Engineer, Gulf Refining Co.
MORRISON, D. T., 202 Girard Blvd., SE., Albuquerque, N. Mex.—Land Surveyor
MURRAY, Franklin R., Room 202, Citizens Marine Jefferson Bank Bldg., Newport News, Va.—Consulting Engineer
MUSSELMAN, Glenn E., 2354 Dunstan Rd., Houston, Tex.—Senior Civil Engineer, Texas Pipe Line Co.
NELSON, John E., 2238 Mimosa St., Houston, Tex. —Civil Engineer, Gulf Oil Co.
NETZ, Norman, 2 Maguire Ave., Albany, N. Y.—Chief of Party, Grow Construction Co.
O'CONNOR, Charles J., 1507 W. Birchwood Ave., Chicago 26, Ill.—Land Surveyor
OFFIELD, John F., 424 Central St., West Albuquerque, N. Mex.—Right-of-Way Engineer, Public Service Company of New Mexico
PALMER, Dorrance W., 9 Walter Ave., Highland Park, N. J.—Civil Engineer and Land Surveyor, Raymond P. Wilson
PARROTT, Walter, Jr., 16425 Maple Wild Ave., Seattle 66, Wash.—Land Surveyor
PAYNE, J. M., Jr., 4496 Estrella St., San Diego, Calif.—Instrumentman, Dept. of Public Works, City of Chula Vista
PEASE, Ernest W., 1723 Franklin St., Oakland, Calif.—Representative, East Bay Blueprint and Supply Co.
PIEPENBURG, Clarence H., 5121 N. 24th St., Milwaukee 9, Wis.—Partner, Badger Surveying Co.
PLAMBECK, Chas. L., 3516 N. Frazier St., Baldwin Park, Calif.—Senior Survey Party Chief, Los Angeles County Flood Control District
PRESTON, Kenneth L., Box 622, Kellogg, Idaho—Mining Engineer and Surveyor
PRICE, William B., 1825 19th St., Bakersfield, Calif. —Resident Surveyor, General Petroleum Corp.
READ, Ernest A., 110 Walker St., Taunton, Mass. —Asst. City Engineer, Taunton, Mass.
READ, Robert L., 4503 Sunburst St., Bellaire, Tex. —Civil Engineer, Stanolind Oil and Gas Co.
REED, Lt. Comdr. Harry D., Jr., U. S. Coast and Geodetic Survey, Washington, D. C.
REINFELD, Stanley J, 2087 17th Ave., San Francisco, Calif.—Surveyor's Field Asst., City of San Francisco
ROBINSON, D. Hunter, 821 N. Main St., Anderson, S. C.—Owner, Robinson Engineering Co.
ROTHEY, Donald C., 137 Ellsworth Ave., Elizabeth, Pa.—Party Chief, Harrison Construction Co.
SACKETT, T. H., 231 S. Grant Ave., Fort Collins, Colo.—County Surveyor, Larimer County
SCHMIDT, Milton H., 3463 N. 4th St., Milwaukee, Wis.—Partner, Badger Surveying Co.
SEIFORD, Raymond E., P. O. Box 2099, Houston, Tex.—Junior Surveyor, Shell Oil Co.
SELWYN, Joseph, 14 Linden Ave., Belmont 78, Mass. —Surveyor

SHEPHERD, Gerald L., Route 1, Box 392, Great Falls, Mont.—Construction Engineer, Anaconda Copper Mining Co.
SHERIDAN, Beecher I., R. F. D. 1, Amlin, Ohio—Chief Surveyor, The Jennings-Lawrence Co.
SHUTTS, Fred N., 324 Pujo St., Lake Charles, La.—Partner, F. Shutts' Sons, Civil and Consulting Engineers
SIEVER, Raymond W., c/o Robert H. Ray Co., 2500 Bolsover Rd., Houston 5, Tex.—Chief Draftsman, Robert H. Ray Co.
SMITH, John F., 602 White St., Springfield 8, Mass.—Civil Engineer, Smith and Wallen Engineering Co., Inc.
SMITH, Merton C., 245 Arthur St., Springfield, Mass.
SNYDER, Ralph G., 23 Annapolis Blvd., NW., Glen Burnie, Md.—Land Surveyor
SNYDER, Winfield S., Jr., 4516 N. 10th St., Tacoma 6, Wash.—Surveyor, Tacoma City Light Co.
SOLANDER, Arvo A., 508 Amherst Rd., South Hadley, Mass.—Engineer and Surveyor
SOUZA, Manuel R., P. O. Box 416, Wailuku, Maui, T. H.—Surveyor and Building Appraiser, Territory Tax Office
STEAKLEY, Floyd, P. O. Box 340, Cleburne, Tex.—County Surveyor, Johnson County
STERN, Sylvan P., 6812 Harrow St., Forest Hills 75, N. Y.—Senior Instructor, New York City Community College of Applied Arts and Sciences
STIMSON, A. C., 2405 San Jacinto St., Houston, Tex.
STOREY, Roy J., 129 Meadow St., Renton, Wash.
STRAIT, Jacob F., Sr., Elko, S. C.—Surveyor
STRATFORD, Leland M., 1913 253rd St., Lomita, Calif.—Surveyor, City of Los Angeles
SUGUITAN, Jose, Bureau of Lands, Manila, P. I.—Chief, Division of Surveys
THOFEHRN, Hans Augusto, Technical Cooperation Section, U. S. Coast and Geodetic Survey, Washington, D. C.—Chief Cartographer, Geographic Survey, Rio Grande do Sul, Brazil
THOMPSON, C. A., 4646 Spruce St., Bellaire, Tex.—Surveyor, Stickle, Thompson and Co.
THORNTON, Raymond J., 3223 Terrace Dr., Suitland, Md.—Research Analyst, U. S. Navy Hydrographic Office
THURMAN, Jack E., 2655 Forrest St., Beaumont, Tex.—Surveyor and Civil Engineer, Sun Oil Co.
TOKARZ, Stanley R., 120 Grand View Ave., Worcester, Mass.—Civil Engineer, Worcester County Engineers
TUFANO, Robert, 6 Paula Dr., South Farmingdale, L. I., N. Y.—Chief of Party, Edwin S. Voorhis and Son, Inc
VANCE, John J., 9329 E. Bartola Ave., Pico, Calif.—Chief of Party, Los Angeles County Sanitation Dist.
VEIGEL, L. W., 614 Third Ave., W., Dickinson, N. Dak.—Consulting Engineer and Land Surveyor
WALLACE, Trueman S., District Bldg., Washington, D. C.—Engineer in Charge of Field Party, Surveyor's Office
WARNICK, David A., Baker Bldg., Rochester, Pa.—Asst. to the President, Michael Baker, Jr., Inc.
WATSON, T. A., 1825 19th St., Bakersfield, Calif.—Instrumentman, General Petroleum Corp.
WAUGH, Mrs. Jane A., 6602 Westmoreland Ave., Takoma Park 12, Md.—Cartographic Aid, Special Maps Branch, U. S. Geological Survey
WICZER, Max A., 6311 13th St., NW., Washington 11, D. C.—Cartographer, U. S. Coast and Geodetic Survey
WILLIAMS, Donald L., P. O. Box 1415, San Angelo, Tex.—Civil Engineer and Surveyor, Sun Oil Co.
WILLIAMS, H. L., 940 Main St., Jacksonville, Fla.—Asst. Engineer, City of Jacksonville
WOLTERS, M. R., Box 2180, Houston, Tex.—Senior Civil Engineer, Humble Oil and Refining Co.
YARBERRY, Hoot, 140 Esperson Bldg., Houston, Tex.—Manager, Houston Blueprint and Stationery Co.

FROM A TITLE LAWYER

As a title examiner, I have found my membership in your organization beneficial, and I enjoy reading your publication very much.

I plan to recommend membership to other lawyers interested in this work, and practicing in Ohio. I would appreciate, therefore, your mailing to me 50 applications for membership.

LEON P. LOECHLER

APPLICATION FOR MEMBERSHIP

I am interested in surveying and mapping and hereby apply for membership in the American Congress on Surveying and Mapping. I enclose $5.00 (U. S. and Possessions), $6.00 (Foreign) in payment of annual dues.

Name (Please type or print) .....

Mailing Address .....

Occupation and Organization .....

Branches of surveying and mapping preferred .....

Reference. If registered, please indicate .....

SUSTAINING MEMBERS

ABRAMS INDUSTRIES, (Abrams Aerial Survey Corp., Abrams Instrument Co.), Lansing, Mich.

AERO SERVICE CORP., 236 East Courtland St., Philadelphia, Pa.

C. L. BERGER & SONS, INC., 37 Williams St., Boston, Mass.

EUGENE DIETZGEN Co., Chicago—New York—San Francisco—New Orleans

GEO OPTIC CO., 170 Broadway, New York 38, N. Y.

GRANT PHOTO PRODUCTS, INC. (Formerly Grant Positype Corporation of America), 18915 Detroit Ave., Cleveland, Ohio

W. & L. E. GURLEY (4 Memberships), Troy, N. Y.

HILGER & WATTS, LTD., London, England; represented by JARRELL-ASH CO., 26 Farwell St., Newtonville 60, Mass., and THE A. LIETZ CO., 840 Post St., San Francisco, Calif.

KERN & CO., LTD., Aarau, Switzerland; represented by Kern Instruments Inc., 120 Grand St., White Plains, N. Y.

KEUFFEL & ESSER CO., Adams & Third Sts., Hoboken, N. J.

THE A. LIETZ CO., 840 Post St., San Francisco, Calif.

RAND MCNALLY & CO., (2 Memberships), Chicago, Ill.

PAFFORD, JONES & WHITE, 5328 Hollywood Blvd., Hollywood 27, Calif.

REED RESEARCH INC., 1048 Potomac St., N. W., Washington 7, D. C.

W. J. ROBBINS & CO., 885 N. LaSalle St., Chicago 10, Ill.

R. M. TOWILL, 205 Merchant St., Honolulu, Hawaii

HENRY WILD SURVEYING INSTRUMENT SUPPLY CO. OF AMERICA, INC., Main and Covert Streets, Port Washington, N. Y.

CONGRESS DIRECTORY

EXECUTIVE OFFICERS

PRESIDENT: Carroll F. Merriam, Pennsylvania Water & Power Co., Lexington Bldg., Baltimore 3, Md.

VICE PRESIDENT: William C. Wattles, 1653 Santa Barbara Ave., Glendale 8, Calif.

EXECUTIVE SECRETARY: Walter S. Dix, 435 Woodward Bldg., c/o TVA, Washington 5, D. C.

TREASURER: Maj. Richard T. Evans, 1368 Euclid St., N. W., Washington 9, D. C.

EDITOR: Robert C. Eller, Topographic Div., U. S. Geological Survey, Washington 25, D. C.

DIVISION CHAIRMEN

CARTOGRAPHY: Arthur F. Striker, U. S. Geological Survey, Room 6214 GSA Bldg., Washington 25, D. C.

CONTROL SURVEYS: Capt. Albert J Hoskinson, U. S. Coast and Geodetic Survey, Washington 25, D. C.

EDUCATION: Prof Henry B. Aikin, Dept. of Civil Engineering, University of Tennessee, Knoxville, Tenn.

INSTRUMENTS: Talbert Abrams, 606 E. Shiawassee St., Lansing 1, Mich.

PROPERTY SURVEYS: Willfred B. Williams, 227 Ottawa N. W., Grand Rapids, Mich.

TOPOGRAPHY: Earle J. Fennell, U. S. Geological Survey, Washington 25, D. C.

STANDING COMMITTEE CHAIRMEN

BUDGET: John M. Amstadt, 5350 2nd St. North, Arlington, Va.

CONSTITUTION: Marshall S. Wright, Sr., 1308 Fort Hunt Rd., Alexandria, Va.

MAP USE: Walter G. Stoneman, Route 2, Fairfax, Va.

MEMBERSHIP: Capt. Frank S. Borden, P. O. Box 6244, Washington 15, D. C.

PROFESSIONAL STATUS: Sol A. Bauer, 1836 Euclid Ave., Cleveland 15, Ohio

PUBLICATIONS: Morris M. Thompson, U. S. Geological Survey Room 2009 GSA Bldg., Washington 25, D. C.

PUBLIC RELATIONS: B. Everett Beavin, Sr., 331 E. Maple Rd., Linthicum Hts., Baltimore, Md.

FIFTEENTH ANNUAL MEETING: Sec'y Dix (Acting), Box 470, Benjamin Franklin Station, Washington 4, D. C.

LOCAL SECTION OFFICERS

NORTHERN CALIFORNIA: Logan N. Muir, Jr. *Chairman*, c/o State Div. of Beaches and Parks, 1211 16th St., Sacramento 14, Calif.
Roland H. Moore, *Secretary*, P. O. Box 197 (T&C), Sacramento 21, Calif.

SOUTHERN CALIFORNIA: Charles R. Herr, *Chairman*, 1776 Orangewood St., Pasadena 4, Calif.
Don P. Jones, *Secretary*, 5328 Hollywood Blvd., Los Angeles 27, Calif.

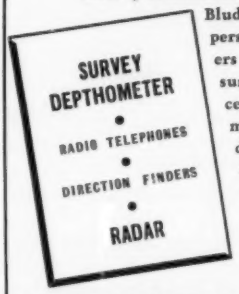
TEXAS: W. H. Wilson, *Chairman*, Humble Oil and Refining Co., P. O. Box 2180, Houston, Tex.
K. E. Britain, *Secretary*, Tennessee Gas Transmission Co., P. O. Box 2511, Houston, Tex.

NOTICE TO ANNUAL MEETING EXHIBITORS

Organizations planning to exhibit at the ASP-ACSM Consecutive Meetings, March 1955, are urged to make early arrangements with the Coordinator of the Exhibits Board, 118 E. Westmoreland Road, Falls Church, Va., in order that adequate and suitable space may be provided for all desiring to exhibit. The choice exhibit spaces are being taken up rapidly, so prompt attention to this matter is recommended.

UNDERWATER SURVEYS
MADE EASIER

Fast . . . accurate and permanently recorded



Bludworth Marine's Supersonic Survey Recorders make underwater surveys faster with exceptional accuracy. A must for channel dredging, salvage or coastal construction. Reveals character of bottom material while recording depth.

BLUDWORTH MARINE
Precision built electronic equipment since 1926
92 Gold Street, New York 38, N. Y.
Division of National-Simplex-Bludworth, Inc.

PRE-CONVENTION JOURNAL

Advertising Tie-in Opportunity

The next Annual Meeting of the American Congress on Surveying and Mapping will be held March 7–11, 1955.

The October–December issue of the JOURNAL will tie-in with the forthcoming Convention. Prepare to advertise your exhibit and products in this important issue to stimulate the interest of those potential buyers attending this event. From an advertising standpoint, this issue will be even more valuable because of the consecutive Annual Meetings of the American Congress on Surveying and Mapping and the American Society of Photogrammetry.

Exclusive advertising agency for the ACSM JOURNAL:

sba *SCHALER, BUTLER & ASSOCIATES*
Advertising—1616 EYE STREET, N.W., WASHINGTON 6, D. C.

MAP ACCURACY

begins with the **Bausch & Lomb METROGON Aerial Camera Lens**

Your assurance of sharp, accurately detailed pictures— the kind you need for precision mapping—is the Bausch & Lomb Metrogon Lens on your camera. Full wide angle coverage, with radial and tangential distortion held within stringent military specifications (MIL-L-7367). Trouble-free performance and dependable, consistent picture quality have made Metrogon photogrammetry's standard for the past 15 years. As the first step toward highest accuracy in your final maps, specify a Bausch & Lomb lens for your camera.

WRITE for complete information on the world's finest photogrammetric equipment, including Metrogon, Planigon, Multiplex, Auto-focus Rectifier, and Twinplex. Bausch & Lomb Optical Co., 74333 St. Paul St., Rochester 2, N. Y.

BAUSCH & LOMB
SINCE B&L 1853

Photogrammetric EQUIPMENT

The KERN NK3 Level

"Truly to-morrows level today"

The ULTIMATE in QUALITY & PRECISION

yet priced competitively with levels of less modern design & accuracy.

Catalogs giving complete descriptions and prices of the NK3 as well as other modern instruments of the KERN Line, will be gladly sent on request.

Remember—"There is no better way to call attention to yourself and your progressive engineering techniques—than to use a Kern surveying instrument."

SURVEYING INSTRUMENT REPAIRS

We have the most modern, newly and completely equipped instrument repair shop in the south. Our equipment includes the only factory designed collimators for adjusting in this part of the country, also we have new microscope equipped devices for centering horizontal limbs and verniers, special mandrels, taps and dies and other fixtures and tools for the factory type repair of your instruments. Our supply of parts are all new and factory made. We do not "cannibalize" old instruments for parts or use any old worn material in our repairs. We have new factory parts for most popular makes of instruments—and our prices are consistent with the quality of the work performed. We can give as prompt service as the magnitude of your repair job will allow.

R. L. SARGENT CO.

M & M BUILDING Telephone AT-5880 Night MA-4832 HOUSTON 2, TEXAS

ENGINEERS & SURVEYORS INSTRUMENTS
SALES — RENTALS — REPAIRS
INSTRUMENTS BOUGHT & SOLD
STEEL TAPES, RANGE POLES, LEVEL RODS

"Instruments sold and repaired by the R. L. SARGENT COMPANY are in service all over the world."

ASKANIA

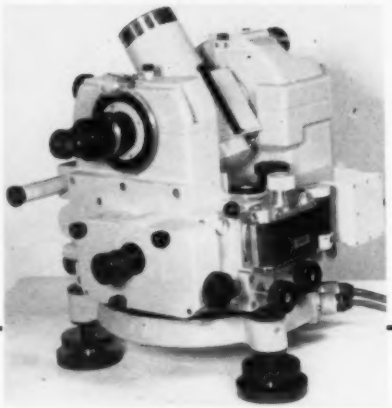
GIGAS

PRECISION THEODOLITE

The GIGAS Precision Theodolite is of compact, closed—in design and embodies a number of advantages not available in other types of modern instruments for precise geodetic work.

Some of these advantages can be summed up as follows: photographing of both circles with Robot miniature camera utilizing standard 35mm film and provided with automatic release and film transport, thus saving time and expense in completing a station, at the same time enhancing the accuracy of the observation; for first and second order triangulation; utilizing the instrument for flare triangulation so essential in inaccessible areas or over water; for astronomical purposes as a universal instrument, such as determination of LaPlace points, measuring astronomical azimuths.

The photographic feature of this instrument relieves the observer of the continuous reading of the circles, thus making it possible for him to keep the instrument sighted at the target and keeping the elevation level properly centered.



OPTICAL DATA:

Broken telescope with three exchangeable eyepieces for 40, 63 and 80 power magnification; telescope focus 500 mm, free aperture 63 mm; adjustable glass circles for azimuth and elevation, diameter 200 mm and 140 mm respectively; detachable optical micrometer, direct reading to 0.2"; automatic camera with spring drive for 48 exposures on standard 35 mm film. Simultaneous recording of the reading of both circles as well as photographing of cross level and clock.

The following data are obtained on each record:
An image of that part of the azimuth and elevation circle which is in the field of view, the coincidence method being used for later evaluation; an image of the plate or alidade level free from parallax at the exact moment of observation; time indication at the moment the exposure was made; station identification by means of handwritten notation of the observer on the film.

For evaluating the film, the theodolite micrometer is used which can easily be taken off and mounted in a stand for facilitating the reading of the film. Thus, the same image of the film is produced as can be seen during visual observation of the theodolite.

The instrument is made in the plants of ASKANIA WERKE AG, Germany US Sector, well known manufacturers of precision instruments for science and industry.

For further details write to

170 Broadway GEO-OPTIC CO. INC. New York 38, N. Y.

cut costs, save time,
with the handy

BRUNTON*
POCKET
TRANSIT

it's easy
to carry...

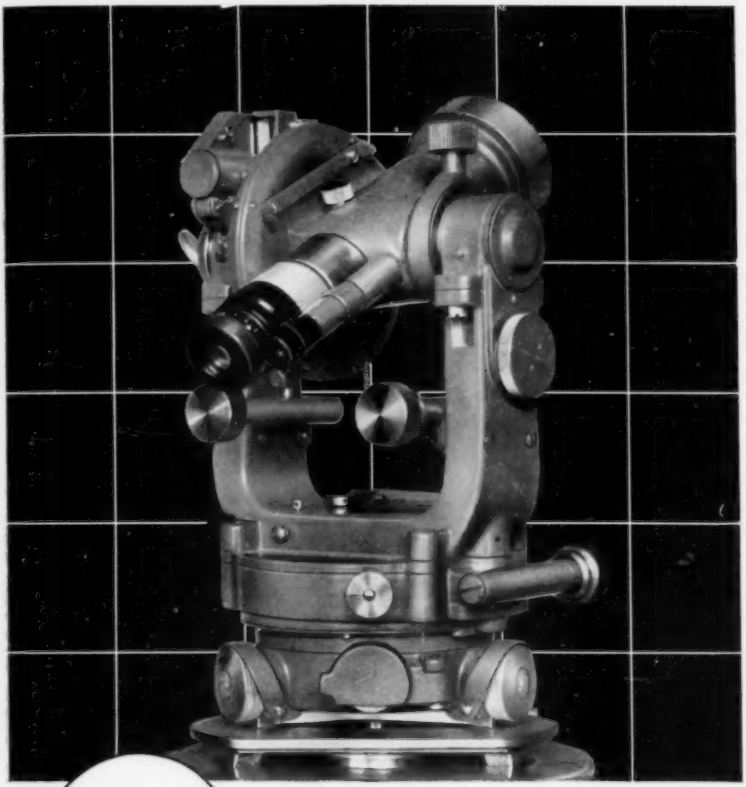
- in your pocket
- on your belt
- in the car

Weighs only 9 oz.—2¾"x3"x1⅛"

Thousands of users have found that much preliminary and supplemental survey work can be done with a Brunton Pocket Transit, making it possible to use their expensive instruments and big surveying crews more efficiently — saving time and money.

*Brunton is a registered trademark of

WM. AINSWORTH & SONS, INC.
3151 LAWRENCE ST. • DENVER 2, COLORADO



DKM 2

Kern AARAU

SURVEYING INSTRUMENT DIVISION

KERN INSTRUMENTS INC.

TO SERVE YOU BETTER

THE KERN ONE SECOND THEODOLITE embodies exclusive Kern patented design features to obtain better and more precise final results more simply, more rapidly and with less effort.

Learn how your next job can be made easier
Write for Booklet DK518-6

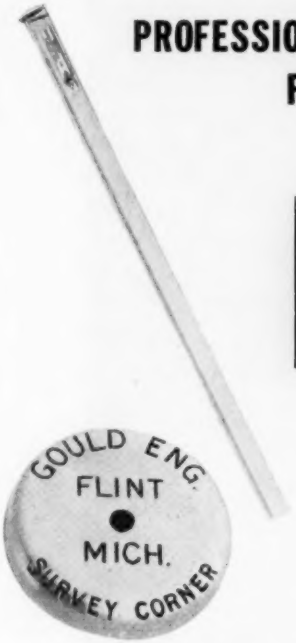
•

Service Department,
Factory Personnel

•

120 GRAND STREET, WHITE PLAINS, N. Y., WHite Plains 9-0101

PROFESSIONAL PROPERTY MARKERS FOR PROFESSIONAL SURVEYORS



A Permanent Marker
Responds to Dip Needle
Ideal for Hard Ground Conditions
Minimum Storage and Carrying Space
Lighter Weight Hammer Required
Professional Advertising Value
Positive Identification

Bathey Personalized Identification Caps and Alloy Steel Surveyor Stakes are sold only to authorized professional engineers and surveyors.

Available to qualified Professional Engineers are
BATHEY BRASS CAP TUBING MONUMENT MARKERS.

MEETS THE REQUIREMENTS OF GOVERNMENT SPECIFICATIONS

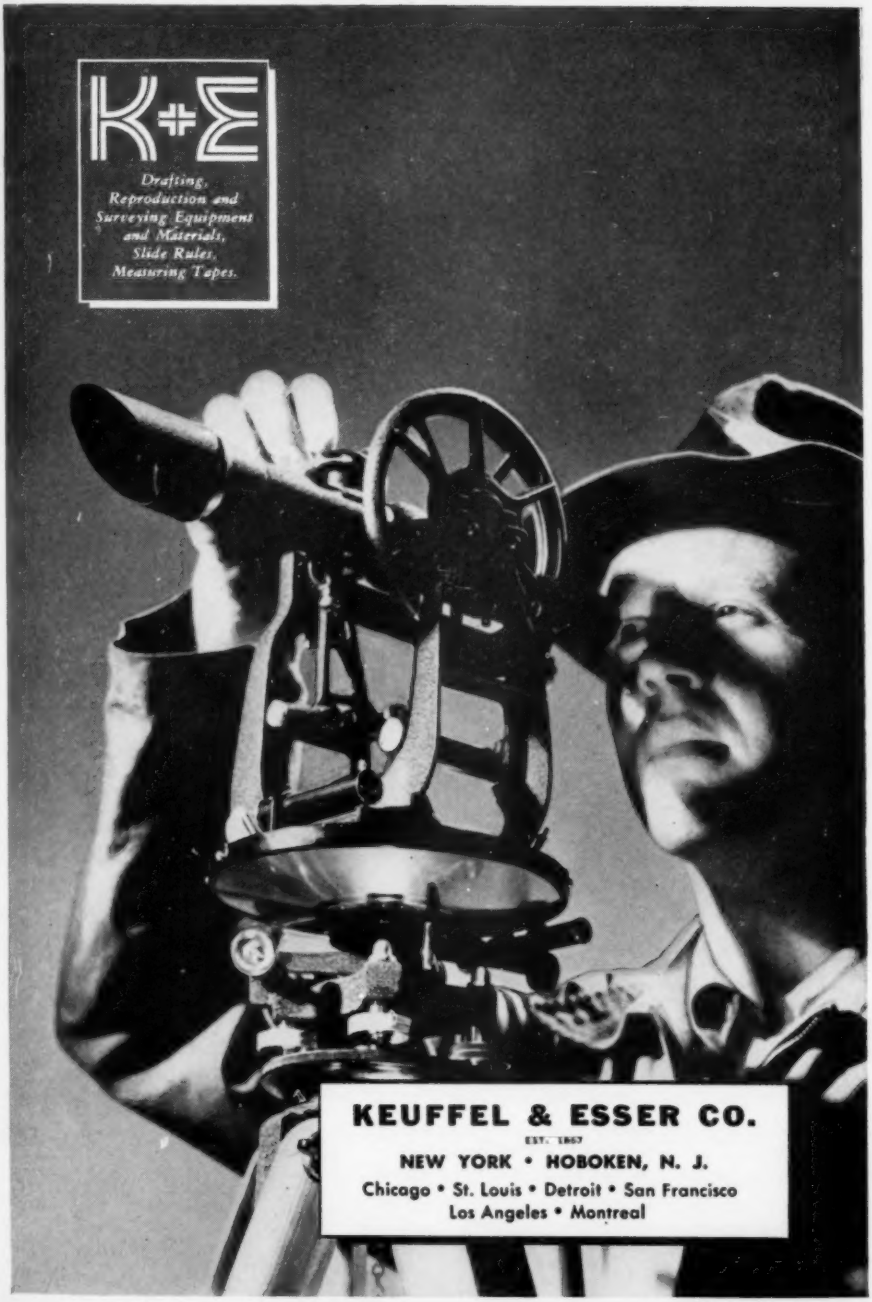
Manufactured By and Sold Directly from the Factory of

MBC

BATHEY MANUFACTURING CO.

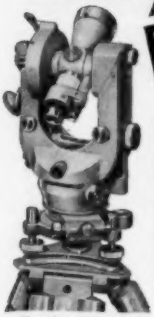
A Michigan Corporation Whose Officers Are Members of The American Congress on Surveying and Mapping

100 SOUTH MILL ST. PLYMOUTH, MICHIGAN


K+E
Drafting, Reproduction and Surveying Equipment and Materials, Slide Rules, Measuring Tapes.
KEUFFEL & ESSER CO.
EST. 1867
NEW YORK • HOBOKEN, N. J.
Chicago • St. Louis • Detroit • San Francisco
Los Angeles • Montreal

AN IDEAL
WILD "WORKING TEAM"
For Any Angle
From Every Angle
ON
HIGHWAY • RAILWAY • TUNNEL
BRIDGE • SKYSCRAPER • DAM
or any other Job . . . big or small

WILD HEERBRUGG
N-II
PRECISE LEVEL
Light-weight, sturdy Tilting Level for universal application.



WILD HEERBRUGG
T-I
OPTICAL *Repeating* TRANSIT
Rugged, compact design . . . with 20 years of proven service under tough field conditions.

Engineers on important developments throughout the world depend on these inherently accurate WILD surveying instruments . . . Swiss precision designed for stability under adverse conditions, for sturdiness and for ease in operation.

EXCLUSIVE WESTERN DISTRIBUTOR OF WILD INSTRUMENTS

Here at Surveyors Service is found the most experienced and largest instrument sales and repair service located in the West. For over 30 years, Surveyors Service Company has guarded the reputation of its customers through its skilled technicians and modern, accurate technical equipment.

Call upon us, as distributors and representatives of a complete line of equipment for surveyors and engineers.

WRITE FOR YOUR COPY OF OUR SIX PAGE INFORMATION FOLDER

SURVEYORS SERVICE CO.
George A. Greenewald

SERVCO
Reg. T.M.

2021 South Grand Avenue
Los Angeles 7, California
Richmond 7-0606

All Kinds of
Field Equipment
and SUPPLIES

Exclusive Distributors
Seiler Instrument Company
WILD CALIFORNIA ARIZONA NEVADA
Agents for
C. L. Berger & Sons, Inc.

PING

ct
20
ugh

or

ts
pany
NEVADA
Inc.